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Mississippi Agricultural Experiment Station
Agricultural College, Mississippi.

BULLETIN No. 151.

INSPECTION AND ANALYSES OF COTTON-SEED MEAL

ON SALE IN THE STATE.

CHEMICAL LABORATORY.

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AGRICULTURAL COLLEGE, MISSISSIPPI

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MISSISSIPPI FERTILIZER AND FEEDING STUFF CONTROL.

INSPECTION AND ANALYSES OF COTTON-SEED MEAL.

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THE INSPECTION OF COTTON-SEED MEAL

Season 1910-1911

Introduction.—During the season of 1910-1911 samples drawn by regular inspectors were analyzed. Analyses of 234 were published in Bulletin No. 148 distributed in July. In addition to the foregoing 95 samples were received from the mills. These samples were analyzed, as required by the fertliizer law, but analyses of inspectors' samples only are published this season. Inspectors are now drawing samples from all parts of the State and it is hoped that the first Bulletin of the season of 1911-1912 can be issued early during the winter.

Purchasers of cottonseed meal are almost continually reminded through Experiment Station Bulletins and agricultural journals that accurate analyses supply the only data upon which intelligent purchases of sound meal can be based and this is true whether the meal is used for feeding animals or employed as a fertilizer, i. e., for feeding plants, because its most valuable constituents in either case are the nitrogenous compounds contained in it. Animals make direct use of the nitrogenous compounds, while they are used indirectly by plants.

Cottonseed meal is distinctly a feeding stuff, and the practice of using it directly as a fertilizer material is very wasteful. Meal contains more protein than any of the common feed stuffs. The proteins carried by the meal contain practically all of its nitrogen. The proteins must form a part of the rations of all animals, and they constitute its most expensive part.

Experiments have shown that one pound of cottonseed meal will produce as much milk or beef as two pounds of corn meal. At the present time, however, good cottonseed meal is somewhat cheaper than corn meal.

But as a fertilizer alone, good cottonseed meal is worth more than the market price. Progressive farmers know that the best management requires that advantage be taken of both the feeding and fertilizer value of meal. The manure (liquid and solid) from a ton

of meal contains at least 70% of the fertilizer constituents in the original meal. If even 50% of these constituents reach the farm, all of its feeding value and half of its fertilizer value are recovered.

Purchase of cottonseed meal.—In this state the law allows meal of any quality to be sold so long as the bags containing it are properly branded, but no discriminating purchaser will buy low grade meal. Since many farmers and feeders make their purchases without first considering the analysis (i. e., the amount of nitrogen) a law requiring all meal sold in the state to be of good quality would prove beneficial. The statutes of some states forbid the sale of any meal that does not contain at least 6.18% of nitrogen (equivalent to 7.51% of ammonia and 38.63% of protein). The mills would have no trouble in making meal of this quality.

The **price per ton** should not be considered apart from the composition as shown by analysis or guaranty. A competition based on **price** instead of upon **price and quality** is responsible, doubtless, for many very unwise purchases. It is not sufficient for a purchaser to conclude that an arbitrary difference of, say, a dollar a ton, is a proper measure of the actual difference in value between meals of different quality, for the commercial values computed from analyses published in this Bulletin will show that, even between meals entitled to classification as High Grade, difference as great as several dollars a ton are not uncommon. The table of comparative values on page 6 will illustrate the significant variations in actual value which may exist.

Since the amount of nitrogen may be fairly used in estimating comparative values, the sale of meal on a **unit basis** ought to prove very satisfactory. As an illustration of this, we may assume that $4.00 a unit is a fair price for meal. A **unit** is one per cent., e. g., a meal carrying 6.50% of nitrogen contains 6.50 units, which, at $4.00 a unit, would be worth 6.50 times $4.00, or $26.00 a ton, while meal containing 7.00% of nitrogen or 7.00 units would be worth $28.00 a ton, and a meal containing only 5.00% of nitrogen, or 5.00 units, would be worth $20.00 a ton.

The sale of meal on the unit basis would place the trade upon the only proper basis, for those mills making the best meal would justly receive for their product the best price. The table of analyses will show that a few mills sell meal containing as much or more than 7.00% of nitrogen. Certainly the purchaser receives greater value in buying this meal than if he bought from another mill a quality carrying only 6.20% of nitrogen. If the same price is paid for the two grades, the

purchaser is in reality paying a meal price for the additional amount of hulls in the lower grade product, for the various qualities of meal are govered very largely by the hulls not removed in the processes of manufacture. It should be pointed out, however, that seed vary in quality, so that all meals containing, say, 6.50% of nitrogen do not necessarily contain the same proportion of hulls. From the standpoint of the purchaser, however, the conditions are essentially unchanged, because he pays most largely for the nitrogen, and, if it is not present in proper amount, he does not receive it, whether the deficiency in nitrogen be due entirely to too large a proportion of hulls or to both hulls and a poor quality of seed.

The sale of meal on the unit basis, as explained above, would prove especially helpful to many farmers who give little attention to buying meal and improper competition between the mills would be avoided altogether.

Table of comparative values.—The following table is inserted for the convenience of buyers in comparing values of various grades of meal. It is assumed that meal containing 6.40% of nitrogen can be bought for $25.00 a ton.

If meal containing 6.40 per cent. of nitrogen is worth $25.00 a ton.

Meal containing 7.20% of nitrogen is worth approximately	$28.12
Meal containing 7.10% of nitrogen is worth approximately	27.73
Meal containing 7.00% of nitrogen is worth approximately	27.34
Meal containing 6.90% of nitrogen is worth approximately	26.95
Meal containing 6.80% of nitrogen is worth approximately	26.56
Meal containing 6.70% of nitrogen is worth approximately	26.17
Meal containing 6.60% of nitrogen is worth approximately	25.78
Meal containing 6.50% of nitrogen is worth approximately	25.39
Meal containing 6.40% of nitrogen is worth approximately	25.00
Meal containing 6.30% of nitrogen is worth approximately	24.61
Meal containing 6.20% of nitrogen is worth approximately	24.22
Meal containing 6.10% of nitrogen is worth approximately	23.83
Meal containing 6.00% of nitrogen is worth approximately	23.44
Meal containing 5.90% of nitrogen is worth approximately	23.05
Meal containing 5.80% of nitrogen is worth approximately	22.66
Meal containing 5.70% of nitrogen is worth approximately	22.27
Meal containing 5.50% of nitrogen is worth approximately	21.48
Meal containing 5.25% of nitrogen is worth approximately	20.51
Meal containing 5.00% of nitrogen is worth approximately	19.53
Meal containing 3.50% of nitrogen is worth approximately	13.67

General results of the inspection.—It is very encouraging to be able to point out that with comparatively few exceptions, the mills have met and exceeded their guaranties. The analyses will show that some mills are selling meal of exceptional quality.

This Bulletin contains 288 analyses. Of this number only two samples are deficient to the extent of 10%. Fifteen samples were found to be as much as 5% below guarantee. The remaining deficiencies were comparatively slight. On the other hand 17.4% of all analyses in this Bulletin are as much or more than 10% above guaranty. The percentage 5% above guaranty is gratifyingly large. If this standard is maintained in the future the public will have little cause to complain when the business is considered as a whole.

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	BARBER & LEWIS OIL CO., Edwards, Miss.	
17781	H. G. Cottonseed Meal	Chas. H. Halsmith, Bolton
	BROOKHAVEN COTTON OIL & FERTILIZER CO., Brookhaven, Miss.	
17753	H. G. Cottonseed Meal	H. H. McGehee, Summit
17768	H. G. Cottonseed Meal	W. J. Carter, Bassfield
17772	H. G. Cottonseed Meal	Hudson & Co., Sumrall
17788	H. G. Cottonseed Meal	J. L. Holmes, Tylertown
17791	H. G. Cottonseed Meal	D. C. Coney, Bogue Chitto
17872	H. G. Cottonseed Meal	Biloxi Milling Co., Biloxi
17941	H. G. Cottonseed Meal	Lucedale Commercial Co., Lucedale
17944	H. G. Cottonseed Meal	Ovett Merc. Co., Ovett
17985	H. G. Cottonseed Meal	C. Atkinson's Sons Co., Summit
18000	H. G. Cottonseed Meal	Hudson & Co., Sumrall
19122	H. G. Cottonseed Meal	Merchants Groc. Co., Hattiesburg
	H. E. BRIDGES & COMPANY, Memphis, Tenn.	
17981	H. G. Cottonseed Meal	Carlyle & Taylor, Aberdeen
	BUCKEYE COTTON OIL CO., Greenwood, Miss.	
17849	H. G. Cottonseed Meal	J. L. Wells, Meridian
17851	H. G. Cottonseed Meal	Threefoot Bros. & Co., Meridian
17888	H. G. Cottonseed Meal	T. M. Steele & Sons, Forest
17918	H. G. Cottonseed Meal	Gulfport Groc., Co., Gulfport
17927	H. G. Cottonseed Meal	Gallaspy Bros. & Co., Union
17951	H. G. Cottonseed Meal	Forest Merc. Co., Forest
17955	H. G. Cottonseed Meal	Stewart Bros., Morton
19123	H. G. Cottonseed Meal	Gulfport Groc. Co., Gulfport
19124	H. G. Cottonseed Meal	Union Naval Stores, Gulfport
19125	H. G. Cottonseed Meal	W. E. Laird, Hattiesburg
19126	H. G. Cottonseed Meal	Tom Lyell Groc. Co., Meridian
19127	H. G. Cottonseed Meal	Queen City Feed Store, Meridian
19128	H. G. Cottonseed Meal	Gulfport Groc. Co., Gulfport
	BUCKEYE COTTON OIL CO., Jackson, Miss.	
17765	H. G. Cottonseed Meal	Morgan Co., Collins
17770	H. G. Cottonseed Meal	Farmers Warehouse Co., Carson
17780	H. G. Cottonseed Meal	Kennedy & Co., Wiggins
17797	H. G. Cottonseed Meal	W. G. McInnis, Pinola

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17781	7.95	6.37	*6.18*	7.74	*7.51*	27.07	*26.27*
17753	8.44	6.41	*6.18*	7.79	*7.51*	27.24	*26.27*
17768	8.72	6.39	*6.18*	7.77	*7.51*	27.16	*26.27*
17772	8.53	6.13	*6.18*	7.45	*7.51*	26.05	*26.27*
17788	8.03	6.39	*6.18*	7.77	*7.51*	27.16	*26.27*
17791	7.71	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
17872	7.40	6.53	*6.18*	7.94	*7.51*	27.75	*26.27*
17941	7.61	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
17944	7.86	6.43	*6.18*	7.82	*7.51*	27.33	*26.27*
17985	8.66	6.45	*6.18*	7.84	*7.51*	27.41	*26.27*
18000	8.87	6.04	*6.18*	7.34	*7.51*	25.67	*26.27*
19122	8.80	6.17	*6.18*	7.50	*7.51*	26.22	*26.27*
17981	6.82	6.54	*6.18*	7.95	*7.51*	27.80	*26.27*
17849	7.11	5.96	*6.18*	7.25	*7.51*	25.33	*26.27*
17851	6.39	6.27	*6.18*	7.62	*7.51*	26.65	*26.27*
17888	7.93	6.73	*6.18*	8.18	*7.51*	28.60	*26.27*
17918	8.69	6.33	*6.18*	7.70	*7.51*	26.90	*26.27*
17927	8.15	6.26	*6.18*	7.61	*7.51*	26.61	*26.27*
17951	7.62	6.40	*6.18*	7.78	*7.51*	27.20	*26.27*
17955	6.37	6.59	*6.18*	8.01	*7.51*	28.01	*26.27*
19123	8.64	5.85	*6.18*	7.11	*7.51*	24.86	*26.27*
19124	8.72	5.70	*6.18*	6.93	*7.51*	24.23	*26.27*
19125	8.36	6.31	*6.18*	7.67	*7.51*	26.82	*26.27*
19126	8.07	5.81	*6.18*	7.06	*7.51*	24.69	*26.27*
19127	7.74	6.24	*6.18*	7.59	*7.51*	26.52	*26.27*
19128	9.52	5.97	*6.18*	7.26	*7.51*	25.37	*26.27*
17765	7.27	6.59	*6.18*	8.01	*7.51*	28.01	*26.27*
17770	8.05	6.60	*6.18*	8.02	*7.51*	28.05	*26.27*
17780	7.97	5.96	*6.18*	7.25	*7.51*	25.33	*26.27*
17797	7.82	6.57	*6.18*	7.99	*7.51*	27.92	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17798	H. G. Cottonseed Meal	The Lampton Co., Columbia
17801	H. G. Cottonseed Meal	The Rankin Co., Columbia
17805	H. G. Cottonseed Meal	Gaddis & Slay Co., Magee
17806	H. G. Cottonseed Meal	H. A. Brown, Magee
17814	H. G. Cottonseed Meal	Conner Lumber Co., Seminary
17838	H. G. Cottonseed Meal	Farmers Warehouse Co., Pontotoc
17862	H. G. Cottonseed Meal	Buckley-Terry Co., Laurel
17877	H. G. Cottonseed Meal	Farmers' Union Warehouse, Gulfport
17881	H. G. Cottonseed Meal	Kennedy & Co., Wiggins
17882	H. G. Cottonseed Meal	The Tate Co., Laurel
17899	H. G. Cottonseed Meal	Brandon Merc. Co., Brandon
17925	H. G. Cottonseed Meal	C. W. Alexander Co., Louin
17942	H. G. Cottonseed Meal	Dorsett & Co., Richton
17946	H. G. Cottonseed Meal	C. W. Alexander Co., Louin
17947	H. G. Cottonseed Meal	L. D. McLaurin, Montrose
17948	H. G. Cottonseed Meal	C. W. Alexander, Montrose
17949	H. G. Cottonseed Meal	Bay Springs Feed & Whse Co., Bay Spg
17988	H. G. Cottonseed Meal	The Lampton Co., Columbia
17989	H. G. Cottonseed Meal	The Conner-Vaughn Co., Columbia
17990	H. G. Cottonseed Meal	Columbia Groc. Co., Columbia
17991	H. G. Cottonseed Meal	W. M. Prine, Weathersby
17994	H. G. Cottonseed Meal	Farmers Warehouse Co., Mize
18005	H. G. Cottonseed Meal	R. W. Hinton Co., Lumberton
18012	H. G. Cottonseed Meal	J. K. Dunn, McComb
18016	H. G. Cottonseed Meal	E. Edwards, Mendenhall
19129	H. G. Cottonseed Meal	R. H. Green & Bro., Jackson
19130	H. G. Cottonseed Meal	Merchants Groc. Co., Hattiesburg
19131	H. G. Cottonseed Meal	W. M. Biglane, Collins
19132	H. G. Cottonseed Meal	Foote-Patrick Co., Laurel
19133	H. G. Cottonseed Meal	R. W. Hinton Co., Lumberton
	CANTON OIL MILL COMPANY, Canton, Miss.	
17897	H. G. Cottonseed Meal	Paragon Gin Co., Canton
17935	H. G. Cottonseed Meal	Alexander & Brock, West
17964	H. G. Cottonseed Meal	Paragon Gin Co., Canton
17965	H. G. Cottonseed Meal	T. M. Howard, Canton
	CENTRAL COTTON OIL CO., Jackson, Miss.	
17751	H. G. Cottonseed Meal	J. K. Dunn, McComb
17758	H. G. Cottonseed Meal	H. E. Little, Oma
17763	H. G. Cottonseed Meal	H. S. Garrett, Star
17769	H. G. Cottonseed Meal	H. T. McGehee & Bro., Carson
17771	H. G. Cottonseed Meal	J. H. Williams & Sons, Prentiss
17778	H. G. Cottonseed Meal	McHenry Merc. Co., McHenry
17786	H. G. Cottonseed Meal	J. S. Allred & Sons, Hazlehurst
17790	H. G. Cottonseed Meal	J. D. Weathersby, McComb

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17798	7.09	6.57	*6.18*	7.99	*7.51*	27.92	*26.27*
17801	6.79	6.55	*6.18*	7.96	*7.51*	27.84	*26.27*
17805	7.58	6.44	*6.18*	7.83	*7.51*	27.37	*26.27*
17806	7.88	6.66	*6.18*	8.10	*7.51*	28.31	*26.27*
17814	7.43	6.48	*6.18*	7.88	*7.51*	27.54	*26.27*
17838	7.41	6.61	*6.18*	8.04	*7.51*	28.09	*26.27*
17862	8.47	6.56	*6.18*	7.98	*7.51*	27.88	*26.27*
17877	8.19	6.76	*6.18*	8.22	*7.51*	28.73	*26.27*
17881	7.77	7.03	*6.18*	8.55	*7.51*	29.88	*26.27*
17882	6.55	7.13	*6.18*	8.67	*7.51*	30.32	*26.27*
17899	7.96	6.56	*6.18*	7.98	*7.51*	27.88	*26.27*
17925	9.11	6.46	*6.18*	7.85	*7.51*	27.46	*26.27*
17942	7.75	6.83	*6.18*	8.30	*7.51*	29.03	*26.27*
17946	7.61	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
17947	7.22	5.96	*6.18*	7.25	*7.51*	25.33	*26.27*
17948	7.32	5.77	*6.18*	7.02	*7.51*	24.52	*26.27*
17949	7.29	6.33	*6.18*	7.70	*7.51*	26.90	*26.27*
17988	7.98	6.71	*6.18*	8.16	*7.51*	28.52	*26.27*
17989	7.75	6.72	*6.18*	8.17	*7.51*	28.56	*26.27*
17990	9.03	6.72	*6.18*	8.17	*7.51*	28.56	*26.27*
17991	9.28	6.61	*6.18*	8.04	*7.51*	28.09	*26.27*
17994	7.89	6.85	*6.18*	8.33	*7.51*	29.11	*26.27*
18005	7.82	6.44	*6.18*	7.83	*7.51*	27.37	*26.27*
18012	8.32	6.48	*6.18*	7.88	*7.51*	27.54	*26.27*
18016	8.27	6.38	*6.18*	7.76	*7.51*	27.12	*26.27*
19129	8.62	6.11	*6.18*	7.43	*7.51*	25.97	*26.27*
19130	8.54	6.18	*6.18*	7.51	*7.51*	26.27	*26.27*
19131	9.14	6.10	*6.18*	7.42	*7.51*	25.93	*26.27*
19132	8.62	6.27	*6.18*	7.62	*7.51*	26.65	*26.27*
19133	9.15	6.06	*6.18*	7.37	*7.51*	25.76	*26.27*
17897	7.78	6.99	*6.18*	8.50	*7.51*	29.71	*26.27*
17935	8.04	6.82	*6.18*	8.29	*7.51*	28.99	*26.27*
17964	6.02	6.96	*6.18*	8.46	*7.51*	29.58	*26.27*
17965	8.03	6.46	*6.18*	7.85	*7.51*	27.46	*26.27*
17751	8.00	6.68	*6.18*	8.12	*7.51*	28.39	*26.27*
17758	8.09	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
17763	7.61	6.53	*6.18*	7.94	*7.51*	27.75	*26.27*
17769	8.68	6.72	*6.18*	8.17	*7.51*	28.56	*26.27*
17771	8.47	6.60	*6.18*	8.02	*7.51*	28.05	*26.27*
17778	9.24	6.30	*6.18*	7.66	*7.51*	26.78	*26.27*
17786	8.64	6.28	*6.18*	7.64	*7.51*	26.69	*26.27*
17790	7.29	6.62	*6.18*	8.05	*7.51*	28.14	*26.27*

TABLE I.—Analyses of Cottonseed Meal[1]

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17792	H. G. Cottonseed Meal	W. F. Boone, Monticello
17793	H. G. Cottonseed Meal	W. F. Boone, Monticello
17796	H. G. Cottonseed Meal	H. S. Garrett, Star
17800	H. G. Cottonseed Meal	Conner-Vaughn Co., Columbia
17809	H. G. Cottonseed Meal	Holloway & McRaney Co., Collins
17822	H. G. Cottonseed Meal	W. E. Laird, Hattiesburg
17883	H. G. Cottonseed Meal	Dunnagin-Whittaker Co., Laurel
17887	H. G. Cottonseed Meal	The Lampton Co., Columbia
17956	H. G. Cottonseed Meal	T. B. Gaddis, Morton
17960	H. G. Cottonseed Meal	J. S. Allred & Son, Hazlehurst
17995	H. G. Cottonseed Meal	Holloway & McRaney Co., Collins
18010	H. G. Cottonseed Meal	Wm. Atkinson & M'Donald Co., Wess'n
19134	H. G. Cottonseed Meal	J. S. Allred & Sons, Hazlehurst
19135	H. G. Cottonseed Meal	The Lampton Co., Columbia
	CLAY COUNTY COTTON OIL CO., West Point, Miss.	
17841	H. G. Cottonseed Meal	L. A. Sanderson, Vardaman
17843	H. G. Cottonseed Meal	Clay Co. Cot. Oil Co., West Point
17847	H. G. Cottonseed Meal	D. D. Morrison, DeKalb
17973	H. G. Cottonseed Meal	L. A. Sanderson, Vardaman
17978	H. G. Cottonseed Meal	W. M. Sheffield, Maben
17980	H. G. Cottonseed Meal	Clay Co. Cotton Oil Co., West Point
	CRYSTAL SPRINGS OIL MILL, FERT. & M'F'G. CO., Crystal Springs, Miss.	
18009	H. G. Cottonseed Meal	Lotterhos & Huber Co., Crystal Sp'gs.
	DEESON OIL MILL, Deeson, Miss.	
17782	H. G. Cottonseed Meal	C. J. Edwards & Co., Vicksburg
	DeSOTO OIL MILL COMPANY, Greenville, Miss.	
17914	H. G. Cottonseed Meal	Ruffin Merc. Co., Ellisville
17916	H. G. Cottonseed Meal	Kennedy Bros., New Augusta
	DIXIE GRAIN COMPANY, Mobile, Ala.	
17876	H. G. Cottonseed Meal	J. F. Krebbs, Moss Point

NO GUARANTEE—ILLEGAL

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17792	8.25	6.29	*6.18*	7.65	*7.51*	26.73	*26.27*
17793	7.80	6.66	*6.18*	8.10	*7.51*	28.31	*26.27*
17796	7.89	6.78	*6.18*	8.24	*7.51*	28.82	*26.27*
17800	7.36	6.58	*6.18*	8.00	*7.51*	27.97	*26.27*
17809	7.87	6.51	*6.18*	7.91	*7.51*	27.67	*26.27*
17822	7.76	6.41	*6.18*	7.79	*7.51*	27.24	*26.27*
17883	8.19	6.68	*6.18*	8.12	*7.51*	28.39	*26.27*
17887	6.60	6.69	*6.18*	8.13	*7.51*	28.43	*26.27*
17956	7.16	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
17960	6.87	6.50	*6.18*	7.90	*7.51*	27.63	*26.27*
17995	8.55	6.64	*6.18*	8.07	*7.51*	28.22	*26.27*
18010	8.52	6 74	*6.18*	8.19	*7.51*	28.65	*26.27*
19134	9.27	6.51	*6.18*	7.91	*7.51*	27.67	*26.27*
19135	8.20	6.53	*6.18*	7.94	*7.51*	27.75	*26.27*
17841	6.65	6.82	*6.18*	8.29	*7.51*	28.99	*26.27*
17843	6.26	6.98	*6.18*	8.49	*7.51*	29.67	*26.27*
17847	6.34	6.85	*6.18*	8.33	*7.51*	29.11	*26.27*
17973	7.59	7 03	*6.18*	8.55	*7.51*	29.88	*26.27*
17978	7.42	6.37	*6.18*	7.74	*7.51*	27.07	*26.27*
17980	7.07	6.85	*6.18*	8.33	*7.51*	29.11	*26.27*
18009	7.07	7.25	*6.18*	8.81	*7.51*	30.81	*26.27*
17782	8.28	6.43	*5.50*	7.82	*6.69*	27.33	*23.38*
17914	8.58	6.13	*6.18*	7.45	*7.51*	26.05	*26.27*
17916	9.46	5.96	*6.18*	7.25	*7.51*	25.33	*26.27*
17876	8.29	6 11		7.43		25 97	

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	EAGLE COTTON OIL COMPANY, Meridian, Miss.	
17747	H. G. Cottonseed Meal	W. M. Hyde & Co., Poplarville
17775	H. G. Cottonseed Meal	McLeod & Co., Purvis
17858	H. G. Cottonseed Meal	L. N. Knobles, State Line
17900	H. G. Cottonseed Meal	Loper Merc. Co., Lake
17906	H. G. Cottonseed Meal	R. W. Fagan & Co., Waynesboro
17909	H. G. Cottonseed Meal	W. S. Rogers & Son, Portersville
17915	H. G. Cottonseed Meal	Eureka Lumber Co., Eastabutchie
17923	H. G. Cottonseed Meal	L. D. McLaurin, Montrose
17950	H. G. Cottonseed Meal	Forest Gin & Mfg. Co., Forest
18006	H. G. Cottonseed Meal	McLeod & Co., Purvis
19136	H. G. Cottonseed Meal	McLeod & Co., Purvis
	A. H. GEORGE & CO., Meridian, Miss.	
17854	H. G. Cottonseed Meal	Quitman Vehicle & Harness Co., Q'tm'n
17860	H. G. Cottonseed Meal	State Line Merc. Co., State Line
19138	H. G. Cottonseed Meal	A. H. George & Co., Meridian
19139	H. G. Cottonseed Meal	Winner-Klein Co., Meridian
	FARMERS & GINNERS COTTON OIL COMPANY, Birmingham, Ala.	
19137	H. G. Cottonseed Meal	Meyer Bros., Meridian
	GRENADA OIL MILL, Grenada, Miss.	
17836	H. G. Cottonseed Meal	F. S. Leavell, Oxford
17895	H. G. Cottonseed Meal	W. S. Gordon, Pickens
17936	H. G. Cottonseed Meal	Durant Ice & Coal Co., Durant
17967	H. G. Cottonseed Meal	Grenada Oil Mill, Grenada
19140	H. G. Cottonseed Meal	Gulfport Groc. Co., Gulfport
	HAZLEHURST OIL MILL & FERTILIZER COMPANY, Hazlehurst, Miss.	
17749	H. G. Cottonseed Meal	Summerland Merc. Co., Summerland
17754	H. G. Cottonseed Meal	Ginn-McDonald Co., Tylertown
17755	H. G. Cottonseed Meal	W. F. Funchess & Co., Osyka
17756	H. G. Cottonseed Meal	Bolian Merc. Co., Bogue Chitto
17759	H. G. Cottonseed Meal	J. S. Reno, Hopewell
17762	H. G. Cottonseed Meal	L. McDonald, D'Lo
17896	H. G. Cottonseed Meal	C. F. Nelson & Sons, Goodman

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17747	6.60	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
17775	6.75	6.44	*6.18*	7.83	*7.51*	27.37	*26.27*
17858	7.25	6.84	*6.18*	8.32	*7.51*	29.07	*26.27*
17900	7.21	6.58	*6.18*	8.00	*7.51*	27.97	*26.27*
17906	7.25	6.84	*6.18*	8.32	*7.51*	29.07	*26.27*
17909	8.17	6.44	*6.18*	7.83	*7.51*	27.37	*26.27*
17915	8.94	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
17923	7.55	6.61	*6.18*	8.04	*7.51*	28.09	*26.27*
17950	6.79	6.79	*6.18*	8.26	*7.51*	28.86	*26.27*
18006	7.27	6.38	*6.18*	7.76	*7.51*	27.12	*26.27*
19136	8.99	5.38	*6.18*	6.54	*7.51*	22.87	*26.27*
17854	7.91	6.00	*6.18*	7.29	*7.51*	25.50	*26.27*
17860	6.98	6.51	*6.18*	7.91	*7.51*	27.67	*26.27*
19138	9.02	5.70	*6.18*	6.93	*7.51*	24.23	*26.27*
19139	8.74	5.82	*6.18*	7.08	*7.51*	24.74	*26.27*
19137	9.21	5.68	*6.18*	6.91	*7.51*	24.14	*26.27*
17836	8.45	6.29	*6.20*	7.65	*7.54*	26.73	*26.35*
17895	9.23	6.41	*6.20*	7.79	*7.54*	27.24	*26.35*
17936	8.47	6.37	*6.20*	7.74	*7.54*	27.07	*26.35*
17967	8.17	6.58	*6.20*	8.00	*7.54*	27.97	*26.35*
19140	9.77	6.39	*6.20*	7.77	*7.54*	27.16	*26.35*
17749	5.99	7.18	*6.18*	8.73	*7.51*	30.52	*26.27*
17754	6.11	7.08	*6.18*	8.61	*7.51*	30.09	*26.27*
17755	6.67	7.24	*6.18*	8.80	*7.51*	30.77	*26.27*
17756	7.09	7.04	*6.18*	8.56	*7.51*	29.92	*26.27*
17759	7.19	6.90	*6.18*	8.39	*7.51*	29.33	*26.27*
17762	5.33	7.12	*6.18*	8.66	*7.51*	30.26	*26.27*
17896	7.27	7.06	*6.18*	8.58	*7.51*	30.01	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17957	H. G. Cottonseed Meal	Simpson Merc. Co., Terry
17961	H. G. Cottonseed Meal	R. L. Davis, Brookhaven
17983	H. G. Cottonseed Meal	Ginn-McDonald Co., Tylertown
17984	H. G. Cottonseed Meal	Osyka Supply Co., Osyka
17987	H. G. Cottonseed Meal	J. S. Reno, Hopewell
18013	H. G. Cottonseed Meal	W. F. Funchess & Co., Osyka
	HOLLANDALE COTTON OIL MILL Hollandale, Miss.	
17807	H. G. Cottonseed Meal	T. M. Thames, Magee
	IMPERIAL COTTON OIL CO., Macon, Miss.	
17844	H. G. Cottonseed Meal	Imperial Cotton Oil Co., Macon
17846	H. G. Cottonseed Meal	W. A. Parks, Brooksville
17850	H. G. Cottonseed Meal	Myer Bros., Meridian
17886	H. G. Cottonseed Meal	L. C. Smith, Lauderdale
17889	H. G. Cottonseed Meal	Forest Warehouse Co., Forest
17901	H. G. Cottonseed Meal	Myer Bros., Meridian
17902	H. G. Cottonseed Meal	Threefoot Bros. & Co., Meridian
17904	H. G. Cottonseed Meal	J. E. Miller, Leakesville
	INDEPENDENT OIL & FERT. WORKS, Columbus, Miss.	
17831	H. G. Cottonseed Meal	Ind. Oil & Fert. Works, Columbus
	JACKSON FERTILIZER CO., Jackson, Miss.	
17982	H. G. Cottonseed Meal	Centreville Merc. Co., Centreville
18015	H. G. Cottonseed Meal	E. M. Odom, Star
	JACKSON OIL & REFINING CO., Jackson, Miss.	
17746	H. G. Cottonseed Meal	J. E. McNair, Lumberton
17761	H. G. Cottonseed Meal	D'Lo Merc. Co., D'Lo
17764	H. G. Cottonseed Meal	W. C. Ellis & Co., Magee
17773	H. G. Cottonseed Meal	Hattiesburg Groc. Co., Hattiesburg
17779	H. G. Cottonseed Meal	J. S. Addkison, McHenry
17787	H. G. Cottonseed Meal	W. L. Dees, Crystal Springs
17789	H. G. Cottonseed Meal	J. K. Dunn, McComb
17794	H. G. Cottonseed Meal	R. F. Everett, Braxton
17821	H. G. Cottonseed Meal	Hattiesburg Groc. Co., Hattiesburg
17823	H. G. Cottonseed Meal	W. M. Conner, Hattiesburg
17824	H. G. Cottonseed Meal	D. G. Patton & Co., Jackson

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17957	7.12	7.14	*6.18*	8.68	*7.51*	30.35	*26.27*
17961	6.83	7.17	*6.18*	8.72	*7.51*	30.47	*26.27*
17983	7.63	7.11	*6.18*	8.64	*7.51*	30.22	*26.27*
17984	7.64	7.27	*6.18*	8.84	*7.51*	30.90	*26.27*
17987	7.63	7.42	*6.18*	9.02	*7.51*	31.54	*26.27*
18013	7.24	7.08	*6.18*	8.61	*7.51*	30.09	*26.27*
17807	7.62	6.36	*6.18*	7.73	*7.51*	27.03	*26.27*
17844	6.16	6.65	*6.18*	8.09	*7.51*	28.26	*26.27*
17846	7.80	6.37	*6.18*	7.74	*7.51*	27.07	*26.27*
17850	6.31	6.79	*6.18*	8.26	*7.51*	28.86	*26.27*
17886	7.35	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
17889	7.24	6.34	*6.18*	7.71	*7.51*	26.95	*26.27*
17901	7.31	6.64	*6.18*	8.07	*7.51*	28.22	*26.27*
17902	6.79	6.71	*6.18*	8.16	*7.51*	28.52	*26.27*
17904	7.47	6.40	*6.18*	7.78	*7.51*	27.20	*26.27*
17831	7.46	6.61	*6.18*	8.04	*7.51*	28.09	*26.27*
17982	8.45	6.80	*6.18*	8.27	*7.51*	28.90	*26.27*
18015	8.98	6.66	*6.18*	8.10	*7.51*	28.31	*26.27*
17746	7.11	6.57	*6.18*	7.99	*7.51*	27.92	*26.27*
17761	6.12	6.60	*6.18*	8.02	*7.51*	28.05	*26.27*
17764	5.83	6.74	*6.18*	8.21	*7.51*	28.65	*26.27*
17773	5.82	6.64	*6.18*	8.07	*7.51*	28.22	*26.27*
17779	8.09	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
17787	6.47	6.43	*6.18*	7.82	*7.51*	27.33	*26.27*
17789	7.51	6.54	*6.18*	7.95	*7.51*	27.80	*26.27*
17794	7.08	6.21	*6.18*	7.55	*7.51*	26.39	*26.27*
17821	6.48	6.66	*6.18*	8.10	*7.51*	28.31	*26.27*
17823	5.69	6.52	*6.18*	7.93	*7.51*	27.71	*26.27*
17824	7.08	6.04	*6.18*	7.34	*7.51*	25.67	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17861	H. G. Cottonseed Meal	R. W. Fagan & Co., Waynesboro
17868	H. G. Cottonseed Meal	J. H. Shuttles & Son, Brooklyn
17898	H. G. Cottonseed Meal	J. A. Spann & Co., Pelahatchie
17992	H. G. Cottonseed Meal	D'Lo Merc. Co., D'Lo
18003	H. G. Cottonseed Meal	Hattiesburg Groc. Co., Hattiesburg
18011	H. G. Cottonseed Meal	Denman Alford Co., McComb
18014	H. G. Cottonseed Meal	R. F. Everett, Braxton
	LAUREL OIL & FERTILIZER CO., Laurel, Miss.	
17812	Extra H. G. Cottonseed Meal	S. M. Yelverton, Mt. Olive
17884	Extra H. G. Cottonseed Meal	Abney & Travis, Heidelberg
17940	Extra H. G. Cottonseed Meal	Croom & Story, Lucedale
17993	Extra H. G. Cottonseed Meal	E. B. Perry, Taylorsville
17748	H. G. Cottonseed Meal	W. M. Hyde & Co., Poplarville
17760	H. G. Cottonseed Meal	J. W. Pickering, Mendenhall
17808	H. G. Cottonseed Meal	E. B. Perry, Taylorsville
17811	H. G. Cottonseed Meal	S. M. Yelverton, Mt. Olive
17816	H. G. Cottonseed Meal	W. M. Hyde & Co., Poplarville
17817	H. G. Cottonseed Meal	McInnis & Stevenson, Poplarville
17865	H. G. Cottonseed Meal	Abney & Travis, Heidelberg
17938	H. G. Cottonseed Meal	Premium Merc. Co., Merrill
17945	H. G. Cottonseed Meal	J. J. Bradford & Co., Ovett
17996	H. G. Cottonseed Meal	S. M. Yelverton, Mt. Olive
18004	H. G. Cottonseed Meal	W. W. Pigford, Lumberton
18007	H. G. Cottonseed Meal	W. M. Hyde & Co., Poplarville
	LEXINGTON COTTON OIL CO., Lexington, Miss.	
17934	H. G. Cottonseed Meal	Lexington Cot. Oil Co., Lexington
17958	H. G. Cottonseed Meal	Wm. Atkinson & M'Donald Co., Wes'n
17966	H. G. Cottonseed Meal	Lexington Cotton Oil Co., Lexington
	MERIDIAN FERT. FACTORY, Hattiesburg, Miss.	
17943	Golden Rod H. G. Cottonseed Meal	C. H. Stevens Co., Richton
	MERIDIAN FERT. FACTORY, Meridian, Miss.	
17815	Golden Rod H. G. Cottonseed Meal	Sumrall Merc. Co., Sumrall
17893	Golden Rod H. G. Cottonseed Meal	J. N. Tabor, Agent, Louisville
17954	Golden Rod H. G. Cottonseed Meal	Ross Bros. & Summer, Pelahatchie

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17861	7.34	6.31	*6.18*	7.67	*7.51*	26.82	*26.27*
17868	7.48	6.53	*6.18*	7.94	*7.51*	27.75	*26.27*
17898	7.38	6.74	*6.18*	8.19	*7.51*	28.65	*26.27*
17992	7.92	6.64	*6.18*	8.07	*7.51*	28.22	*26.27*
18003	7.48	6.64	*6.18*	8.07	*7.51*	28.22	*26.27*
18011	8.53	6.42	*6.18*	7.81	*7.51*	27.29	*26.27*
18014	8.53	6.36	*6.18*	7.73	*7.51*	27.03	*26.27*
17812	6.41	6.88	*6.56*	8.36	*7.98*	29.24	*27.88*
17884	7.41	6.99	*6.56*	8.50	*7.98*	29.71	*27.88*
17940	7.31	6.30	*6.56*	7.66	*7.98*	26.78	*27.88*
17993	7.60	7.05	*6.56*	8.57	*7.98*	29.96	*27.88*
17748	7.77	6.32	*6.18*	7.68	*7.51*	26.86	*26.27*
17760	7.77	5.66	*6.18*	6.88	*7.51*	24.06	*26.27*
17808	6.60	6.48	*6.18*	7.88	*7.51*	27.54	*26.27*
17811	7.19	6.38	*6.18*	7.76	*7.51*	27.12	*26.27*
17816	6.86	6.37	*6.18*	7.74	*7.51*	27.07	*26.27*
17817	7.53	6.32	*6.18*	7.68	*7.51*	26.86	*26.27*
17865	7.25	6.59	*6.18*	8.01	*7.51*	28.01	*26.27*
17938	8.12	6.30	*6.18*	7.66	*7.51*	26.78	*26.27*
17945	7.36	6.54	*6.18*	7.95	*7.51*	27.80	*26.27*
17996	7.82	6.79	*6.18*	8.26	*7.51*	28.86	*26.27*
18004	8.14	6.11	*6.18*	7.43	*7.51*	25.97	*26.27*
18007	7.60	5.97	*6.18*	7.26	*7.51*	25.37	*26.27*
17934	9.40	6.43	*6.18*	7.82	*7.51*	27.33	*26.27*
17958	8.55	6.50	*6.18*	7.90	*7.51*	27.63	*26.27*
17966	8.61	6.54	*6.18*	7.95	*7.51*	27.80	*26.27*
17943	8.08	6.33	*6.59*	7.70	*8.01*	26.90	*28.01*
17815	6.36	6.82	*6.59*	8.29	*8.01*	28.99	*28.01*
17893	8.29	6.63	*6.59*	8.06	*8.01*	28.18	*28.01*
17954	7.26	6.37	*6.59*	7.74	*8.01*	27.07	*28.01*

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TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17766	H. G. Cottonseed Meal	Ship Island Lumber Co., Sanford
17767	H. G. Cottonseed Meal	R. Watts & Co., Seminary
17845	H. G. Cottonseed Meal	J. H. Williams, Macon
17856	H. G. Cottonseed Meal	F. H. Deas, Enterprise
17885	H. G. Cottonseed Meal	J. M. Carter, Quitman
17911	H. G. Cottonseed Meal	W. Rosenbaum, DeKalb
17912	H. G. Cottonseed Meal	S. D. Stennis & Co., DeKalb
17917	H. G. Cottonseed Meal	J. F. Ruffin Co., New Augusta
	MINTER CITY OIL WORKS, Minter City, Miss.	
17986	S. G. Cottonseed Meal	Hyman Merc. Co., Summit
19141	S. G. Cottonseed Meal	Durant Ice & Coal Co., Durant
	MISSISSIPPI COTTON OIL CO., Columbus, Miss.	
17774	H. G. Cottonseed Meal	Miss. Cot. Oil Co., J. W. Treene, Agent, Purvis
17829	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Columbus
17852	H. G. Cottonseed Meal	Rosenbaum & Little, Lauderdale
	MISSISSIPPI COTTON OIL CO., Grenada, Miss.	
17834	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Grenada
17968	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Grenada
19142	H. G. Cottonseed Meal	M. M. Moody, Long Beach
19143	H. G. Cottonseed Meal	Farmers Wareh'se Co., Charleston
	MISSISSIPPI COTTON OIL CO., Jackson, Miss.	
17752	H. G. Cottonseed Meal	C. Atkinson's Sons Co., Summit
17757	H. G. Cottonseed Meal	L. D. Spell & Bro., Georgetown
17795	H. G. Cottonseed Meal	E. M. Odom, Star
17804	H. G. Cottonseed Meal	Byrne-Rawls Co., Silver Creek
17810	H. G. Cottonseed Meal	G. H. Pond, Collins
17819	H. G. Cottonseed Meal	Stockstill, McGehee Co., Picayune
17820	H. G. Cottonseed Meal	Merchants Groc. Co., Hattiesburg
17870	H. G. Cottonseed Meal	Gulfport Groc. Co., Gulfport
17873	H. G. Cottonseed Meal	W. H. Westphal, Van Cleave
17874	H. G. Cottonseed Meal	J. & S. Anderson, Van Cleave
17875	H. G. Cottonseed Meal	McLeod & Dantzler, Van Cleave
17879	H. G. Cottonseed Meal	M. M. Moody, Long Beach
17880	H. G. Cottonseed Meal	Perkins & Co., Brooklyn
17891	H. G. Cottonseed Meal	Gallaspy Bros. & Co., Union
17919	H. G. Cottonseed Meal	M. M. Moody, Long Beach
17920	H. G. Cottonseed Meal	E. S. Davis & Son, Ocean Springs

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17766	6.88	6.32	*6.18*	7.68	*7.51*	26.86	*26.27*
17767	7.56	6.39	*6.18*	7.77	*7.51*	27.16	*26.27*
17845	8.48	6.26	*6.18*	7.61	*7.51*	26.61	*26.27*
17856	7.10	6.88	*6.18*	8.36	*7.51*	29.24	*26.27*
17885	7.79	6.71	*6.18*	8.16	*7.51*	28.52	*26.27*
17911	8.57	6.34	*6.18*	7.71	*7.51*	26.95	*26.27*
17912	8.41	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
17917	9.27	6.28	*6.18*	7.64	*7.51*	26.69	*26.27*
17986	8.45	6.62	*4.95*	8.05	*6.02*	28.14	*21.04*
19141	8.74	6.44	*4.95*	7.83	*6.02*	27.37	*21.04*
17774	4.93	6.63	*6.18*	8.06	*7.51*	28.18	*26.27*
17829	7.89	6.40	*6.18*	7.78	*7.51*	27.20	*26.27*
17852	8.88	6.45	*6.18*	7.84	*7.51*	27.41	*26.27*
17834	9.20	6.25	*6.18*	7.60	*7.51*	26.56	*26.27*
17968	8.90	6.52	*6.18*	7.93	*7.51*	27.71	*26.27*
19142	11.07	6.08	*6.18*	7.39	*7.51*	25.84	*26.27*
19143	10.89	6.21	*6.18*	7.55	*7.51*	26.39	*26.27*
17752	8.60	6.53	*6.18*	7.94	*7.51*	27.75	*26.27*
17757	7.40	6.80	*6.18*	8.27	*7.51*	28.90	*26.27*
17795	7.87	6.36	*6.18*	7.73	*7.51*	27.03	*26.27*
17804	8.96	6.26	*6.18*	7.61	*7.51*	26.61	*26.27*
17810	8.27	6.34	*6.18*	7.71	*7.51*	26.95	*26.27*
17819	8.44	6.18	*6.18*	7.51	*7.51*	26.27	*26.27*
17820	7.70	6.09	*6.18*	7.40	*7.51*	25.88	*26.27*
17870	8.23	6.20	*6.18*	7.54	*7.51*	26.35	*26.27*
17873	8.54	6.43	*6.18*	7.82	*7.51*	27.33	*26.27*
17874	9.72	6.43	*6.18*	7.82	*7.51*	27.33	*26.27*
17875	8.94	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
17879	8.78	6.63	*6.18*	8.06	*7.51*	28.18	*26.27*
17880	8.28	6.66	*6.18*	8.10	*7.51*	28.31	*26.27*
17891	8.63	6.10	*6.18*	7.42	*7.51*	25.93	*26.27*
17919	8.97	6.48	*6.18*	7.88	*7.51*	27.54	*26.27*
17920	8.82	6.58	*6.18*	8.00	*7.51*	27.97	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17922	H. G. Cottonseed Meal	W. H. Westphal, Van Cleave
17953	H. G. Cottonseed Meal	Ross Bros. & Summer, Pelahatchie
17962	H. G. Cottonseed Meal	R. L. Davis, Brookhaven
17963	H. G. Cottonseed Meal	Max Priebatsch, Brookhaven
17997	H. G. Cottonseed Meal	Ship Island Lumber Co., Sanford
17785	H. G. Cottonseed Meal	Z. Wardlaw, Utica
	MISSISSIPPI COTTON OIL CO., Meridian, Miss.	
17776	H. G. Cottonseed Meal	Picayune Feed & Fert. Co., Picayune
17818	H. G. Cottonseed Meal	R. W. Hinton Co., Lumberton
17853	H. G. Cottonseed Meal	J. M. Carter, Quitman
17859	H. G. Cottonseed Meal	Mrs. R. J. Briggs, Jr., State Line
17863	H. G. Cottonseed Meal	Hand Bros., Ellisville
17878	H. G. Cottonseed Meal	Guy Northrop, Pass Christian
17905	H. G. Cottonseed Meal	Mrs. R. J. Briggs, Jr., State Line
17910	H. G. Cottonseed Meal	Rosenbaum & Little, Lauderdale
17913	H. G. Cottonseed Meal	Farmers Warehouse Co., Ellisville
17921	H. G. Cottonseed Meal	J. & S. Anderson, Van Cleave
17926	H. G. Cottonseed Meal	R. L. Simmons, Newton
	MISSISSIPPI COTTON OIL CO., Natchez, Miss.	
17864	H. G. Cottonseed Meal	Farmers Union Wareh'se Co., Ellisville
	MISSISSIPPI COTTON OIL CO., West Point, Miss.	
17842	H. G. Cottonseed Meal	Miss. Cotton Oil Co., West Point
	MISSISSIPPI COTTON OIL CO., Yazoo City, Miss.	
17937	H. G. Cottonseed Meal	Albert C. Gottche, Ocean Springs
18002	H. G. Cottonseed Meal	Merchants Groc. Co., Hattiesburg
	NATCHEZ OIL COMPANY, Natchez, Miss.	
17784	H. G. Cottonseed Meal	Natchez Oil Co., Natchez
	NEWTON OIL & M'F'G. CO., Newton, Miss.	
17867	H. G. Cottonseed Meal	Foote-Patrick Co., Laurel
17924	H. G. Cottonseed Meal	C. W. Alexander, Montrose
17928	H. G. Cottonseed Meal	J. T. Mitchell, Union
17931	H. G. Cottonseed Meal	J. A. Greaves, Agent, Philadelphia
17952	H. G. Cottonseed Meal	R. I. O'Bannon, Forest
17971	H. G. Cottonseed Meal	Farmers Union Warehouse, Pontotoc
19144	H. G. Cottonseed Meal	Buckley, Terry Co., Laurel

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17922	8.88	6.55	*6.18*	7.96	*7.51*	27.84	*26.27*
17953	8.45	6.30	*6.18*	7.66	*7.51*	26.78	*26.27*
17962	8.75	5.63	*6.18*	6.84	*7.51*	23.93	*26.27*
17963	8.47	5.90	*6.18*	7.17	*7.51*	25.08	*26.27*
17997	9.00	6.33	*6.18*	7.70	*7.51*	26.90	*26.27*
17785	9.28	5.79	*6.18*	7.04	*7.51*	24.61	*26.27*
17776	9.31	6.08	*6.18*	7.39	*7.51*	25.84	*26.27*
17818	9.31	6.59	*6.18*	8.01	*7.51*	28.01	*26.27*
17853	9.03	6.48	*6.18*	7.88	*7.51*	27.54	*26.27*
17859	9.12	6.48	*6.18*	7.88	*7.51*	27.54	*26.27*
17863	9.44	6.22	*6.18*	7.56	*7.51*	26.44	*26.27*
17878	8.88	6.25	*6.18*	7.60	*7.51*	26.56	*26.27*
17905	7.31	6.46	*6.18*	7.85	*7.51*	27.48	*26.27*
17910	8.88	6.53	*6.18*	7.94	*7.51*	27.75	*26.27*
17913	9.08	6.01	*6.18*	7.31	*7.51*	25.54	*26.27*
17921	9.54	6.39	*6.18*	7.77	*7.51*	27.16	*26.27*
17926	9.12	6.72	*6.18*	8.17	*7.51*	28.56	*26.27*
17864	8.78	6.39	*6.18*	7.77	*7.51*	27.16	*26.27*
17842	8.62	6.11	*6.18*	7.43	*7.51*	25.97	*26.27*
17937	9.49	5.32	*6.18*	6.47	*7.51*	22.61	*26.27*
18002	8.72	6.03	*6.18*	7.33	*7.51*	25.63	*26.27*
17784	7.42	6.27	*6.18*	7.62	*7.51*	26.65	*26.27*
17867	7.59	6.90	*6.18*	8.39	*7.51*	29.33	*26.27*
17924	7.45	7.02	*6.18*	8.53	*7.51*	29.84	*26.27*
17928	8.00	6.88	*6.18*	8.36	*7.51*	29.24	*26.27*
17931	8.21	6.88	*6.18*	8.36	*7.51*	29.24	*26.27*
17952	7.31	6.71	*6.18*	8.16	*7.51*	28.52	*26.27*
17971	8.35	7.02	*6.18*	8.53	*7.51*	29.84	*26.27*
19144	8.92	6.57	*6.18*	7.99	*7.51*	27.92	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	NORTH MISSISSIPPI OIL MILLS, Holly Springs, Miss.	
17837	H. G. Cottonseed Meal	North Miss. Oil Mills, Holly Springs
17969	H. G. Cottonseed Meal	North Miss. Oil Mills, Holly Springs
	OKOLONA OIL COMPANY, Okolona, Miss.	
17840	H. G. Cottonseed Meal	Farmers Warehouse Co., Houston
	OXFORD OIL MILL COMPANY, Oxford, Miss.	
17835	H. G. Cottonseed Meal	Oxford Oil Mill Co., Oxford
	PEOPLES' COTTON OIL & FIBRE COMPANY, North Carrollton, Miss.	
17979	H. G. Cottonseed Meal	Buchanan & Co., Eupora
	PLANTERS GIN & OIL CO., Baldwyn, Miss.	
17975	H. G. Cottonseed Meal	Planters Gin & Oil Co., Baldwyn
	PLANTERS OIL MILL, Tunica, Miss.	
17799	H. G. Cottonseed Meal	Conner-Vaughn Co., Columbia
17869	H. G. Cottonseed Meal	M. M. Moody, Long Beach
17871	H. G. Cottonseed Meal	Gulfport Feed Store, Gulfport
	PLANTERS OIL MILL & GIN CO., Kosciusko, Miss.	
17894	H. G. Cottonseed Meal	Planters Oil Mill & Gin Co., Kosciusko
17932	H. G. Cottonseed Meal	Coleman Bros., Noxapater
17933	H. G. Cottonseed Meal	O. L. Shaw, Ackerman
	PLANTERS OIL MILL & M'F'G. COMPANY, Greenwood, Miss.	
17750	H. G. Cottonseed Meal	Denman-Alford Co., McComb
17813	H. G. Cottonseed Meal	R. Watts & Co., Seminary
17857	H. G. Cottonseed Meal	W. L. Weems, Shubuta
17907	H. G. Cottonseed Meal	J. K. Kirkland, Quitman
17908	H. G. Cottonseed Meal	J. W. Shirley, DeSoto

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17837	6.43	6.66	*6.18*	8.10	*7.51*	28.31	*26.27*
17969	6.52	6.58	*6.18*	8.00	*7.51*	27.97	*26.27*
17840	7.32	6.91	*6.18*	8.40	*7.51*	29.37	*26.27*
17835	6.09	7.25	*6.18*	8.81	*7.51*	30.81	*26.27*
17979	8.54	5.90	*6.18*	7.17	*7.51*	25.08	*26.27*
17975	7.49	7.21	*6.18*	8.77	*7.51*	30.64	*26.27*
17799	6.46	6.24	*6.50*	7.59	*7.90*	26.52	*27.63*
17869	8.28	6.15	*6.50*	7.48	*7.90*	26.14	*27.63*
17871	7.64	6.21	*6.50*	7.55	*7.90*	26.39	*27.63*
17894	7.76	6.58	*6.18*	8.00	*7.51*	27.97	*26.27*
17932	7.96	6.70	*6.18*	8.15	*7.51*	28.48	*26.27*
17933	7.62	6.71	*6.18*	8.16	*7.51*	28.52	*26.27*
17750	7.42	6.55	*6.18*	7.96	*7.51*	27.84	*26.27*
17813	7.06	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
17857	7.54	6.33	*6.18*	7.70	*7.51*	26.90	*26.27*
17907	8.34	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
17908	8.26	6.46	*6.18*	7.85	*7.51*	27.46	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17939	H. G. Cottonseed Meal	Premium Merc. Co., Merrill
17998	H. G. Cottonseed Meal	Stewart & Hemeter, Seminary
17999	H. G. Cottonseed Meal	R. Watts & Co., Seminary
18001	H. G. Cottonseed Meal	Sumrall Merc. Co., Sumrall
18008	H. G. Cottonseed Meal	C. J. Edwards Co., Vicksburg
19145	H. G. Cottonseed Meal	C. J. Edwards Co., Vicksburg
	PONTOTOC COTTON OIL CO., Pontotoc, Miss.	
17828	H. G. Cottonseed Meal	Butler & Fife, New Albany
17839	H. G. Cottonseed Meal	Pontotoc Cotton Oil Co., Pontotoc
17890	H. G. Cottonseed Meal	E. P. Donald & Sons, Philadelphia
17929	H. G. Cottonseed Meal	Henderson-Molphus Co., Philadelphia
17930	H. G. Cottonseed Meal	Mars Bros., Philadelphia
17972	H. G. Cottonseed Meal	Pontotoc Cotton Oil Co., Pontotoc
	PORT GIBSON OIL WORKS, Port Gibson, Miss.	
17783	S. G. Cottonseed Meal	Port Gibson Oil Works, Port Gibson
	PRODUCERS COTTON OIL CO., Yazoo City, Miss.	
19146	H. G. Cottonseed Meal	Hattiesburg Groc. Co., Hattiesburg
19147	H. G. Cottonseed Meal	J. K. Dunn, McComb
19148	H. G. Cottonseed Meal	G. B. Hall, Columbia
	REFUGE COTTON OIL CO., Columbus, Miss.	
17830	H. G. Cottonseed Meal	Refuge Cotton Oil Co., Columbus
	RICHMOND COTTON OIL CO., Corinth, Miss.	
17825	H. G. Cottonseed Meal	Richmond Cotton Oil Co., Corinth
17974	H. G. Cottonseed Meal	Houston Ice & Coal Co., Houston
	SHUBUTA OIL & M'F'G. CO., Shubuta, Miss.	
17855	H. G. Cottonseed Meal	D. K. Robeson, DeSoto
	SOUTHERN OIL & FERT. CO., Meridian, Miss.	
17848	H. G. Cottonseed Meal	J. L. Long, Agent, Meridian
17903	H. G. Cottonseed Meal	M. L. McRae & Co., Leakesville

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17939	8.09	6.14	*6.18*	7.47	*7.51*	26.10	*26.27*
17998	7.68	6.11	*6.18*	7.43	*7.51*	25.97	*26.27*
17999	7.99	6.53	*6.18*	7.94	*7.51*	27.75	*26.27*
18001	8.22	6.05	*6.18*	7.36	*7.51*	25.71	*26.27*
18008	7.93	5.83	*6.18*	7.09	*7.51*	24.78	*26.27*
19145	9.21	5.67	*6.18*	6.89	*7.51*	24.10	*26.27*
17828	7.67	6.75	*6.18*	8.21	*7.51*	28.69	*26.27*
17839	7.82	7.38	*6.18*	8.97	*7.51*	31.37	*26.27*
17890	7.72	7.34	*6.18*	8.92	*7.51*	31.20	*26.27*
17929	8.81	7.35	*6.18*	8.94	*7.51*	31.24	*26.27*
17930	9.08	7.27	*6.18*	8.84	*7.51*	30.90	*26.27*
17972	8.47	7.37	*6.18*	8.96	*7.51*	31.32	*26.27*
17783	8.35	6.37	*5.00*	7.74	*6.08*	27.07	*21.25*
19146	9.64	5.94	*6.18*	7.22	*7.51*	25.25	*26.27*
19147	10.12	5.93	*6.18*	7.21	*7.51*	25.20	*26.27*
19148	9.06	5.77	*6.18*	7.02	*7.51*	24.52	*26.27*
17830	7.22	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
17825	8.06	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
17974	8.32	7.31	*6.18*	8.89	*7.51*	31.07	*26.27*
17855	6.04	7.36	*6.18*	8.95	*7.51*	31.28	*26.27*
17848	6.81	6.62	*6.18*	8.05	*7.51*	28.14	*26.27*
17903	7.49	6.85	*6.18*	8.33	*7.51*	29.11	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	TATE BROTHERS, Memphis, Tenn.	
17970	H. G. Cottonseed Meal	C. L. Palmer, Blue Mountain
	TENNESSEE COTTON OIL CO., Jackson, Tenn.	
17826	H. G. Cottonseed Meal	L. L. Brown, Booneville
17976	H. G. Cottonseed Meal	L. L. Brown, Booneville
17977	H. G. Cottonseed Meal	Phillips, Reinhart, Taylor Co., B'n'v'le
	TENNESSEE COTTON OIL CO., Memphis, Tenn.	
17827	H. G. Cottonseed Meal	C. M. Elder, New Albany
	VICKSBURG COTTON OIL CO., Vicksburg, Miss.	
17777	H. G. Cottonseed Meal	D. L. Smith, Carriere
17802	H. G. Cottonseed Meal	Barnes & Co., Columbia
17803	H. G. Cottonseed Meal	Ball Merc. Co., Columbia
17866	H. G. Cottonseed Meal	Hicks Merc. Co., Laurel
	WESSON COTTON OIL & FERTILIZER COMPANY, Wesson, Miss.	
17959	H. G. Cottonseed Meal	Wesson Cotton Oil & Fert. Co., Wesson
	WINONA OIL & M'F'G. CO., Winona, Miss.	
17832	H. G. Cottonseed Meal	W. W. Sheffield, Maben
17833	H. G. Cottonseed Meal	Winona Oil & M'f'g. Co., Winona
17892	H. G. Cottonseed Meal	The Fair Company, Louisville

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
17970	8.12	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
17826	8.52	6.27	*6.18*	7.62	*7.51*	26.65	*26.27*
17976	8.75	6.41	*6.18*	7.79	*7.51*	27.21	*26.27*
17977	9.22	6.32	*6.18*	7.68	*7.51*	26.86	*26.27*
17827	7.09	6.25	*6.18*	7.60	*7.51*	26.56	*26.27*
17777	7.38	6.20	*6.18*	7.54	*7.51*	26.35	*26.27*
17802	5.92	6.33	*6.18*	7.70	*7.51*	26.90	*26.27*
17803	6.12	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
17866	7.03	6.45	*6.18*	7.84	*7.51*	27.41	*26.27*
17959	7.37	6.97	*6.18*	8.47	*7.51*	29.62	*26.27*
17832	7.92	6.83	*6.18*	8.30	*7.51*	29.03	*26.27*
17833	6.56	7.07	*6.18*	8.60	*7.51*	30.05	*26.27*
17892	8.34	6.73	*6.18*	8.18	*7.51*	28.60	*26.27*

Mississippi Agricultural Experiment Station

Agricultural College, Mississippi

BULLETIN No. 152.

INSPECTION AND ANALYSES OF COMMERCIAL FEEDING STUFFS

ON SALE IN THE STATE

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISSISSIPPI

NOVEMBER, 1911.

Tucker Printing House, Jackson, Miss.

MISSISSIPPI FERTILIZER AND FEEDING STUFFS CONTROL.

INSPECTION AND ANALYSES OF FEEDING STUFFS.

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* Resigned November 1, 1911.

GENERAL INSPECTION

OF

COMMERCIAL FEEDING STUFFS.

Season 1910-1911.

Introduction.—This bulletin contains reports of analyses of 280 samples of commercial mixed feeds and feeding stuffs. The value of a feeding stuff which is palatable and adapted to the animal depends upon the amounts of digestible fat, protein, and carbohydrates contained in it. The average amounts of digestible nutrients present in various materials used for feeding have been widely published. Large quantities of mixed feeds are sold annually in this state. Analyses published from time to time show the **total amounts** of fat, protein, carbohydrates, etc., contained in them, but it is not practicable to ascertain with the same degree of accuracy the amounts of these nutrients which are actually **digestible.** The components of these feeds ought to be plainly stated on the tags or branded on the sacks, and it is important also that these mixtures be free of viable weed seeds as well as of unsound grains, by-products, etc.

Relative values.—Since the nutritive value of feeds is measured by the amounts of digestible nutrients contained in them, their **relative commercial values** could be more readily ascertained and illustrated in these tables of analyses if it were possible to compute the market price per pound of fat, protein, and carbohydrates. This is due to the fact that there are no feeds which contain only one of these nutrients from which the average cost per pound could be computed.

Feeds of the **same class** are best compared on the basis of total digestible matter carried by them, e. g., the protein feeds, such as cottonseed meal, gluten feed, brewers' gains, malt sprouts, cottonseed feed (mixture of meal and hulls or low grade meal), etc., may be compared in this way. In a similar manner the digestible matter in the so-called carbohydrate feeds, such as corn, oats, rice polish, low grade flour, etc., will largely determine their relative values as feeds, but it is only feeds of the **same general character** which may be rightfully compared in this way when we wish to determine which is the cheapest to buy. (See table of digestible nutrients in common feeding stuffs on pp. 17 to 19, Bul. No. 144.)

SUGGESTIONS CONCERNING THE PURCHASE OF FEEDS.

All feeding stuffs and mixed feeds must be sold under a definite guarantee. The law requires this. This guarantee is usually printed on tags which are attached to each bag of feed, and it shows the minimum percentage of each nutrient for which the manufacturer, guarantor, or the retailer is legally responsible. A careful inspection of this guaranty should never be omitted. Notwithstanding almost constant caution to be found in agricultural papers and experiment station bulletins, it is a singular fact that some feeders will pay more for a comparatively low grade feed product or mixture than is asked, perhaps by the same dealer, for one containing a larger amount of fat and protein associated with a comparatively small amount of fiber.

Having examined the guarantee, refer to the analyses of the feed in these bulletins to ascertain if the guarantors usually barely meet their guarantee, sometimes fall below it, or usually supply a product considerably above it. Do not be misled by brand names which are suggestive of high quality. A glance at the guarantee or the actual analyses will convey much more information than may be derived from fanciful names of brands of feeds.

Guaranties and analyses indicate total nutrients only. The purchaser should know the materials out of which mixed feeds are made. Examine samples with a view of detecting unsound products. If the feeds contain weed seeds of any kind, they ought to be treated so that there is no probability that the manure from the animals will increase the stock of weeds on the farm.

Feeds containing large percentages of fat and protein cannot be sold at a low price per ton, because these are expensive nutrients.

The more concentrated feeds cannot carry large amounts of fiber. It should be remembered that fiber is the most indigestible portion of any feed, and in addition to this the losses in the digestion of the digestible portion are usually large in comparison with the more easily digested carbohydrates. Fibrous feeds are easily produced on the farm. Hays, straws, hulls of seeds, ground cobs, etc., are cheap in comparison with the more concentrated feeds, such as cottonseed meal, corn, oats, shorts, bran, etc.

The character of feed to be purchased will depend, of course, upon special circumstances. If a feeder has available, for example, corn and grass hay he will need a feed rich in protein to "balance" the ration, and such protein feeds as cottonseed meal, alfalfa, clover,

or peavine hay will require a material rich in carbohydrates to bring the nutrients in the ration into proper proportion.

The sources, classification, composition, and digestibility of feeds, functions of nutrients, feeding standards, making of rations, etc., are discussed in an elementary way in Bulletin No. 144.

Having decided upon the character of the feed, examined guaranties and actual analyses of various feeds which can be obtained, ascertained the materials out of which they are made, etc., the purchaser may then compare the prices asked. The price per ton should not be considered apart from the foregoing information. A competition between sellers based on price alone is deceptive, and it is responsible for many cases of mistaken judgment. A competition based on **price and quality** is essential before the feeding stuffs trade is placed on a sound basis. Manufacturers, intelligent merchants, and progressive farmers and feeders should lose no opportunity of protecting the general trade from the irrational and unfair competition wherein the price per ton is a deciding factor in a transaction. A feeder should know when he is buying a low grade feed, and he should not pay a high price for it.

General results of the inspection.—The general results of the inspection for the entire season of 1910-1911 will be tabulated and discussed in a bulletin whcih will be ready for the press in a short time. Copies of these bulletins will be forwarded as they are issued to any dealer or feeder who applies for them.

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	AKIN-ERSKIN MILLING CO., Evansville, Ind.	
17633	Wheat Bran	Merchants Grocery Co., Water Valley
		Guarantee
*17424	Wheat Shorts	W. B. Potts & Sons, Kosciusko
*18177	Wheat Shorts	W. B. Potts & Sons, Kosciusko
17640	Wheat Shorts	R. L. East, Pontotoc
†17632	Wheat Shorts	Merchants Grocery Co., Water Valley
†18798	Wheat Shorts	Merchants Grocery Co., Water Valley
		Guarantee
	ALFALFA PRODUCTS CO., Jackson, Miss.	
17534	Alcorno	D. G. Patton & Co., Jackson
		a Guarantee
17502	Uno Horse Feed	J. S. Allred & Son, Hazlehurst
17511	Uno Horse Feed	Merchants Grocery Co., Brookhaven
‡17625	Uno Horse Feed	J. S. Allred & Son, Hazlehurst
‡18796	Uno Horse Feed	J. S. Allred & Son, Hazlehurst
		Guarantee
	ALLEN BAKER COMMISSION CO., St. Louis, Mo.	
17416	Bran	E. S. Davis & Son, Ocean Springs
17613	Bran	Gulfport Grocery Co., Gulfport
		Guarantee
	ARKADELPHIA MILLING CO., Arkadelphia, Ark.	
17478	Wheat Bran	R. L. Crook & Co., Vicksburg
17480	Wheat Bran	W. W. Lasiter Co., Vicksburg
17546	Wheat Bran	Hanes & Hood, Vicksburg
		Guarantee
17470	Shorts	Hanes & Hood, Vicksburg
		Guarantee
	AURORA MILLING COMPANY, Aurora, Mo.	
17563	Shorts	W. H. Pritchartt & Co., Natchez
		Guarantee
	C. BECKER MILLING COMPANY, Red Bud, Ill.	
17611	Wheat Bran	Gulfport Grocery Co., Gulfport
17413	Wheat Bran	Corso & Tedesco, Biloxi
		Guarantee
17430	Wheat Shorts	E. J. Wadsworth, Winona
		Guarantee

* Nos. 17424 and 18177 were drawn from the same shipment.
† Nos. 17632 and 18797 were drawn from the same shipment.
‡ Nos. 17625 and 18796 were drawn from the same shipment.
a No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17633	9.22	6.63	4.15	16.69	54.71	8.60
			3.50	*14.00*	*52.00*	*10.00*
17424	10.91	5.78	4.61	15.25	58.39	5.06
18177	11.45	4.88	4.24	16.31	57.41	5.71
17640	9.88	6.41	4.39	18.13	55.29	5.90
17632	10.22	5.63	4.30	18.31	55.56	5.98
18798	9.23	5.30	4.53	17.06	58.14	5.74
			4.50	*16.36*	*62.66*	*3.90*
17534	9.50	5.89	4.17	14.06	53.79	12.59
						.....
17502	11.71	5.39	3.64	14.88	54.76	9.62
17511	10.85	5.27	4.09	17.94	51.70	10.15
17625	10.46	5.10	3.76	12.44	59.04	9.20
18796	7.91	5.56	3.83	12.38	60.30	10.02
			4.00	*14.00*	*52.00*	*12.00*
17416	10.05	6.84	4.74	15.56	54.11	8.70
17613	9.38	6.76	4.72	16.19	53.59	9.36
			3.50	*15.00*	*53.00*	*9.00*
17478	9.38	5.75	5.96	15.88	55.99	7.04
17480	9.76	6.02	6.43	15.31	56.26	6.22
17546	10.33	5.21	5.29	14.13	57.52	7.52
			3.50	*12.00*	*50.00*	*12.00*
17470	11.44	3.42	5.34	15.88	61.10	2.82
			3.50	*12.00*	*50.00*	*12.00*
17563	11.50	4.51	5.30	16.63	58.83	3.23
			4.00	*15.00*	*60.00*	*8.00*
17611	9.19	6.26	4.40	16.38	55.04	8.73
17413	8.35	7.72	4.00	15.56	55.31	9.06
			3.58	*14.50*	*52.00*	*10.00*
17430	12.62	4.20	5.04	16.38	57.99	3.77
			4.20	*15.50*	*60.30*	*3.70*

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	CAIRO MILLING COMPANY, Cairo, Ill.	
17434	Pine Leaf Middlings	L. A. Sanderson, Vardaman
		Guarantee
17436	Premium XXX Horse, Mule and Cow Feed	L. A. Sanderson, Vardaman
		* Guarantee
	CAPE COUNTY MILLING CO., Jackson, Mo.	
17472	Wheat Bran	C. J. Edwards & Co., Vicksburg
17473	Wheat Bran	S. Schwarz & Co., Vicksburg
17481	Wheat Bran	E. Bonelli & Co., Vicksburg
		Guarantee
17471	Wheat Shorts	C. J. Edwards Co., Vicksburg
		Guarantee
	CHARLESTON MILLING CO., Charleston, Mo.	
17425	Bran	W. B. Potts & Sons, Kosciusko
		Guarantee
	COLUMBIA STAR MILLING CO., Columbia, Ill.	
17646	Wheat Bran	Weaver & Azwell Co., Tupelo
		Guarantee
†17653	Wheat Middlings	Davis & Chandler, West Point
†18805	Wheat Middlings	Davis & Chandler, West Point
		Guarantee
	L. P. COOK, Memphis, Tenn.	
17431	Old Miss. Stock Feed	E. J. Wadsworth, Winona
		Guarantee
	CORNO MILLS COMPANY, St. Louis, Mo.	
17476	Corno Hen Feed	P. P. Williams Co., Vicksburg
17499	Corno Hen Feed	Postlethwaite & Stewart Co., Natchez
17530	Corno Hen Feed	Hannah Distributing Co., Jackson
		Guarantee
17399	Corno Horse and Mule Feed	The Hall Co., Laurel
17422	Corno Horse and Mule Feed	Gibson Grocery Co., Ackerman
17433	Corno Horse and Mule Feed	J. L. Walker & Co., Columbus

* No guarantee submitted; sale illegal.

† Nos. 17653 and 18805 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17434	10.65	4.46	4.44	16.31	59.76	4.38
			4.20	*15.75*	*57.95*	*6.10*
17436	10.37	5.56	3.52	9.25	56.72	14.58
17472	10.59	6.85	4.39	15.13	55.74	7.30
17473	10.57	6.94	4.54	14.81	55.12	8.02
17481	9.69	5.84	4.43	16.63	56.23	7.18
			3.50	*11.50*	*52.00*	*9.00*
17471	11.15	3.65	4.63	15.88	61.19	3.50
			3.80	*16.12*	*62.87*	*3.53*
17425	9.39	6.14	5.18	13.06	57.87	8.36
			4.75	*13.10*	*54.50*	*9.20*
17646	10.06	3.94	3.76	15.00	63.76	3.48
			3.74	*15.26*	*53.38*	*9.21*
17653	10.28	3.77	4.33	14.94	62.77	3.91
18805	9.16	3.84	5.02	15.56	62.05	4.37
			5.02	*15.26*	*60.47*	*3.75*
17431	11.31	7.50	4.02	12.00	57.52	7.65
			4.00	*13.00*	*55.00*	*11.50*
17476	12.30	2.54	3.75	11.56	67.72	2.13
17499	11.83	1.57	3.50	11.31	69.73	2.06
17530	12.34	1.90	4.03	10.50	68.90	2.33
			3.50	*10.00*	*68.00*	*5.00*
17399	7.99	5.12	3.39	10.75	58.97	13.78
17422	11.06	4.48	3.58	9.44	59.46	11.98
17433	10.11	4.40	4.14	11.19	59.36	10.80

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17455	Corno Horse and Mule Feed	Holloway and McRaney, Collins
17475	Corno Horse and Mule Feed	P. P. Williams Co., Vicksburg
17498	Corno Horse and Mule Feed	Postlethwaite & Stewart Co., Natchez
17533	Corno Horse and Mule Feed	Hannah Distributing Co., Jackson
17561	Corno Horse and Mule Feed	Postlethwaite & Stewart Co., Natchez
17606	Corno Horse and Mule Feed	The Hall Co., Laurel
*17618	Corno Horse and Mule Feed	C. H. Stevens Co., Richton
*18793	Corno Horse and Mule Feed	C. H. Stevens Co., Richton
17620	Corno Horse and Mule Feed	Bay Spgs. Feed & Wse. Co., Bay Spgs.
17623	Corno Horse and Mule Feed	Merchants Grocery Co., Hazlehurst
17626	Corno Horse and Mule Feed	Barrett Grocery Co., Lexington
17631	Corno Horse and Mule Feed	C. W. Bacon, Vaiden
17641	Corno Horse and Mule Feed	Asa W. Allen, Tupelo
17648	Corno Horse and Mule Feed	Phillips Rinehart Taylor Co., B'ville
17654	Corno Horse and Mule Feed	Gibson Grocery Co., West Point
17661	Corno Horse and Mule Feed	Holloway & McRaney, Collins
17675	Corno Horse and Mule Feed	Greenwood Grocery Co., Greenwood
17688	Corno Horse and Mule Feed	The Goyer Co., Greenville
		Guarantee
	DAHNKE WALKER MILLING CO., Union City, Tenn.	
17649	Wheat Shorts	Phillips Rinehart Taylor Co., B'ville
		Guarantee
	DEAN MILL COMPANY, Ava, Ill.	
17420	Wheat Middlings	Farmers Union Wse. Co., Newton
		Guarantee
	DOMESTIC FLOUR MILLING CO., Kansas City, Mo.	
17438	Wheat Bran	J. L. Wells, Meridian
17449	Wheat Bran	R. W. Fagan & Co., Waynesboro
		Guarantee
17458	Wheat Middlings	Merchants Grocery Co., Hattiesburg
		Guarantee
	DUNLAP MILLING COMPANY, Clarksville, Tenn.	
17635	Wheat Middlings	C. M. Elder, New Albany
		Guarantee
	EDGAR-MORGAN COMPANY, Memphis, Tenn.	
17426	Ceralfa Stock Feed	The Barrett Grocery Co., Lexington
17479	Ceralfa Stock Feed	R. L. Crook & Co., Vicksburg
17543	Ceralfa Stock Feed	R. L. Crook & Co., Vicksburg
17562	Ceralfa Stock Feed	W. H. Pritchartt & Co., Natchez
17621	Ceralfa Stock Feed	J. C. McClinton, Newton

* Nos. 17618 and 18793 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17455	10.69	4.23	3.69	10.81	59.88	10.70
17475	10.82	4.17	4.28	11.63	59.10	10.00
17498	9.76	3.49	2.77	12.38	62.72	8.88
17533	10.34	4.23	3.64	11.06	60.55	10.18
17561	11.68	4.00	3.43	10.38	60.60	9.91
17606	11.22	4.54	3.39	12.69	57.38	10.78
17618	12.11	3.46	3.29	11.31	61.33	8.50
18793	11.38	3.97	1.74	11.19	61.06	10.66
17620	10.91	4.43	3.70	11.81	58.03	11.12
17623	10.85	3.58	4.35	11.38	60.80	9.04
17626	9.25	4.73	3.98	10.50	60.02	11.52
17631	9.58	4.17	3.79	12.00	59.76	10.70
17641	8.81	4.19	3.86	10.81	61.93	10.40
17648	11.18	3.66	3.81	9.94	61.27	10.14
17654	10.06	4.22	3.66	11.06	58.94	12.06
17661	8.29	3.91	3.44	10.88	63.08	10.40
17675	8.89	3.93	3.71	10.25	63.00	10.22
17688	9.00	4.28	4.15	11.56	59.67	11.34
			3.50	*10.00*	*58.50*	*12.00*
17649	11.60	3.62	4.85	14.00	60.55	5.38
			4.85	*13.75*	*62.00*	*7.50*
17420	11.22	7.24	4.93	16.69	55.49	4.43
			4.00	*16.00*	*56.00*	*8.00*
17438	9.80	8.34	4.80	16.56	51.99	8.51
17449	10.76	6.81	4.43	16.88	52.25	8.87
			4.00	*14.50*	*56.00*	*10.00*
17458	10.76	6.26	5.34	17.50	54.00	6.14
			4.00	*15.00*	*56.00*	*7.00*
17635	9.75	4.81	5.00	17.75	57.86	4.83
			4.00	*15.00*	*60.00*	*6.00*
17426	11.05	6.32	4.64	12.94	54.70	10.35
17479	11.20	5.67	3.43	13.69	54.51	11.50
17543	10.17	7.03	4.02	13.25	55.93	9.60
17562	12.21	7.63	4.00	12.94	54.26	8.96
17621	11.34	5.99	4.09	17.63	53.14	7.81

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17628	Ceralfa Stock Feed	Durant Ice and Coal Co., Durant
17670	Ceralfa Stock Feed	Yazoo Grocery Co., Yazoo City
*17687	Ceralfa Stock Feed	The Goyer Co., Greenville
*18812	Ceralfa Stock Feed	The Goyer Co., Greenville
		Guarantee
17477	Gem Scratch Feed	R. L. Crook & Co., Vicksburg
		Guarantee
17630	Manna Hen Feed	Durant Ice and Coal Co., Durant
		Guarantee
17629	Manna Rice Special Chick Feed	Durant Ice and Coal Co., Durant
		Guarantee
	EISENMEYER MILLING CO., Springfield, Mo.	
†17656	Wheat Middlings	Gilmore May Co., Amory
†18806	Wheat Middlings	Gilmore May Co., Amory
		Guarantee
	EMPIRE RICE MILL CO., New Orleans, La.	
17457	Rice Polish	R. Watts & Co., Seminary
17447	Rice Polish	Threefoot Bros. & Co., Meridian
		Guarantee
	A. H. GEORGE & COMPANY, Meridian, Miss.	
17442	George's Mixed Rice Shorts	Winner Klein & Co., Meridian
17444	George's Mixed Rice Shorts	Meyer Bros., Meridian
		Guarantee
	J. T. GIBBONS, New Orleans, La.	
17415	Hominy Feed	E. S. Davis & Son, Ocean Springs
		Guarantee
17418	Rice Bran	W. H. Westphall, Van Cleave
		Guarantee
	B. F. GLOVER & SON COM. CO., New Orleans, La.	
17405	Wheat Bran	Hicks Mercantile Co., Laurel
17417	Wheat Bran	J. & S. Anderson, Van Cleave
17617	Wheat Bran	J. & S. Anderson, Van Cleave
		Guarantee
17402	Wheat Shorts	Johnson-Hand Co., Ellisville
		Guarantee

* Nos. 17687 and 18812 were drawn from the same shipment.
† Nos. 17656 and 18806 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17628	11.39	6.55	4.90	14.81	52.20	10.15
17670	11.95	6.81	4.03	14.00	53.54	9.67
17687	11.15	5.15	3.49	13.06	58.94	8.21
18812	9.36	6.25	2.50	15.69	56.32	9.88
			4.00	*13.00*	*55.00*	*11.50*
17477	11.06	1.54	3.62	11.31	70.15	2.32
			3.50	*10.00*	*65.00*	*4.00*
17630	10.22	1.96	4.30	12.25	68.02	3.25
			3.50	*10.00*	*60.00*	*5.00*
17629	11.31	2.77	3.45	12.31	66.68	3.48
			3.50	*11.00*	*65.00*	*4.00*
17656	10.91	1.44	3.39	15.06	68.50	.70
18806	9.63	1.89	3.13	15.56	68.79	1.00
			4.50	*15.75*	*60.00*	*6.00*
17457	10.49	4.77	9.01	10.81	64.25	.67
17447	10.59	6.15	9.28	11.94	61.14	.90
			7.50	*10.50*	*65.42*	*1.25*
17442	10.24	8.00	10.68	12.31	54.67	4.10
17444	10.72	6.98	11.40	12.38	54.60	3.92
			5.00	*10.00*	*50.00*	*6.50*
17415	8.35	2.92	7.80	10.81	67.45	2.67
			3.50	*10.00*	*60.00*	*8.00*
17418	10.90	9.62	13.56	13.38	41.39	11.15
			8.00	*10.00*	*40.00*	*12.00*
17405	8.27	8.10	4.85	15.81	54.76	8.21
17417	10.82	7.84	5.05	16.06	51.95	8.28
17617	10.30	6.20	4.46	17.06	53.24	8.74
			3.58	*14.85*	*54.60*	*10.00*
17402	7.96	6.90	5.42	16.94	57.96	4.82
			4.50	*14.90*	*56.80*	*7.40*

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	THE GRAIN PRODUCTS CO., Union City, Tenn.	
17639	Butter Fat Middlings	Craig Bros. & Co., New Albany
*17638	Butter Fat Middlings	New Albany Wholesale Grocery Co., New Albany
*18803	Butter Fat Middlings	New Albany Wholesale Grocery Co., New Albany
		Guarantee
	THE GREAT WESTERN CEREAL COMPANY, Chicago, Ill.	
17497	Boss Feed	Rumble & Wensel Co., Natchez
17509	Boss Feed	Louis Cohn & Bro., Brookhaven
17537	Boss Feed	Taylor-Wills Grocery Co., Jackson
17550	Boss Feed	B. Kullman & Co., Natchez
17557	Boss Feed	Rumble & Wensel Co., Natchez
†17636	Boss Feed	New Albany Wholesale Grocery Co., New Albany
†18800	Boss Feed	New Albany Wholesale Grocery Co., New Albany
17651	Boss Feed	A. W. Lunceford, Maben
17677	Boss Feed	Greenwood Grocery Co., Greenwood
17682	Boss Feed	W. L. Campbell, Clarksdale
		Guarantee
17490	Durham Feed	I. Lowenberg & Co., Natchez
‡17521	Durham Feed	D. W. Wilkinson & Bro., Jackson
‡18183	Durham Feed	D. W. Wilkinson & Bro., Jackson
*a*17556	Durham Feed	I. Lowenberg & Co., Natchez
*a*18185	Durham Feed	I. Lowenberg & Co., Natchez
		Guarantee
17526	Excelsior Feed	R. H. Green & Bro., Jackson
*x*17650	Excelsior Feed	Clark Grocery Co., Tupelo
*x*18804	Excelsior Feed	Clark Grocery Co., Tupelo
		Guarantee
17512	Sterling Chick Feed	Merchants Grocery Co., Brookhaven
17538	Sterling Chick Feed	Taylor-Wills Grocery Co., Jackson
		Guarantee
17513	Sterling Scratch Feed	Merchants Grocery Co., Brookhaven
17637	Sterling Scratch Feed	New Albany Wholesale Grocery Co., New Albany
		Guarantee
	GREAT WESTERN FEED CO., St. Louis, Mo.	
17501	Purity Horse and Cat. Feed	Merchants Grocery Co., Hazlehurst
17507	Purity Horse and Cat. Feed	W. F. Funchess & Co., Osyka

* Nos. 17638 and 18803 were drawn from the same shipment.
† Nos. 17636 and 18800 were drawn from the same shipment.
‡ Nos. 17521 and 18183 were drawn from the same shipment.
a Nos. 17556 and 18185 were drawn from the same shipment.
x Nos. 17650 and 18804 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17639	8.98	5.20	5.02	13.63	57.35	9.82
17638	9.57	3.32	3.52	13.13	61.64	8.82
18803	9.51	3.35	3.03	11.88	64.35	7.88
			5.00	*14.00*	*60.00*	*10.00*
17497	9.38	3.77	4.34	12.50	63.74	6.27
17509	9.81	2.79	3.74	9.19	69.18	5.29
17537	9.29	3.16	4.01	10.63	66.61	6.30
17550	11.44	2.61	4.75	9.63	65.20	6.37
17557	10.84	3.98	4.13	10.63	63.88	6.54
17636	9.35	3.05	3.62	11.06	66.05	6.87
18800	8.33	3.51	3.28	9.75	67.23	7.90
17651	9.76	6.51	4.03	9.56	63.98	6.16
17677	8.75	2.40	4.02	10.06	68.99	5.78
17682	8.77	2.89	4.31	10.06	66.35	7.62
			4.00	*9.50*	*60.00*	*10.00*
17490	9.79	4.10	4.01	11.81	64.03	6.26
17521	10.37	2.47	3.67	9.94	67.67	5.88
18183	10.52	3.06	2.85	9.31	66.89	7.37
17556	11.11	2.27	3.45	9.44	68.56	5.17
18185	10.60	3.06	3.51	9.00	69.01	4.82
			4.00	*9.50*	*60.00*	*10.00*
17526	10.25	3.01	4.60	10.31	66.03	5.80
17650	11.80	4.14	3.66	9.69	65.07	5.64
18804	11.12	4.27	2.41	10.06	65.37	6.77
			4.00	*9.50*	*60.00*	*10.00*
17512	10.41	1.34	2.88	10.63	73.22	1.52
17538	10.73	1.30	3.02	10.56	72.90	1.49
			3.50	*10.00*	*65.00*	*4.00*
17513	11.13	1.67	3.60	10.88	70.67	2.05
17637	11.46	1.81	3.50	12.31	69.24	1.68
			3.50	*10.00*	*65.00*	*4.00*
17501	12.62	4.43	1.96	12.25	56.35	12.39
17507	10.79	5.66	3.18	13.50	56.15	10.72

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
*17658	Purity Horse and Cat. Feed	W. F. Funchess & Co., Osyka
*18807	Purity Horse and Cat. Feed	W. F. Funchess & Co., Osyka
		Guarantee
	GULFPORT GROCERY CO., Gulfport, Miss.	
17456	Mile Post	Ship Island Lumber Co., Sanford
17614	Mile Post	Gulfport Grocery Co., Gulfport
17660	Mile Post	The Lampton Co., Columbia
†17663	Mile Post	Hattiesburg Grocery Co., Hattiesburg
†18809	Mile Post	Hattiesburg Grocery Co., Hattiesburg
		Guarantee
	H. L. HALLIDAY MILLING CO., Cairo, Ill.	
17423	Wheat Middlings	Gibson Grocery Co., Ackerman
		Guarantee
	HANNAH DISTRIBUTING CO., Jackson, Miss.	
17659	Wheat Bran	Lampton Mercantile Co., Magnolia
17522	Wheat Bran	D. W. Wilkinson & Bro., Jackson
17510	Wheat Bran	Merchants Grocery Co., Brookhaven
17508	Wheat Bran	Louis Cohn & Bro., Brookhaven
17506	Wheat Bran	J. K. Dunn, McComb
		Guarantee
17531	Rice Polish	Hannah Distributing Co., Jackson
		Guarantee
17532	Wheat Shorts	Hannah Distributing Co., Jackson
		Guarantee
	HATTIESBURG GROCERY CO., Hattiesburg, Miss.	
17518	Rice Polish	Hattiesburg Grocery Co., Hattiesburg
		Guarantee
	ILLINOIS FEED MILLS, St. Louis, Mo.	
17610	Poultry Feed	W. A. McDonald, Bay St. Louis
		Guarantee
17673	Star Feed	J. D. Roberts, Yazoo City
17680	Star Feed	G. A. Wilson, Jr., Greenwood
17683	Star Feed	McMahon Grocery Co., Greenville
		Guarantee
17514	Star Ox Feed	R. W. Hinton Co., Lumberton
17460	Star Ox Feed	Merchants Grocery Co., Hattiesburg
		Guarantee

* Nos. 17658 and 18807 were drawn from the same shipment.
† Nos. 17663 and 18809 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17658	10.10	4.96	3.01	11.56	59.41	10.96
18807	9.13	5.56	2.73	12.19	58.06	12.33
			4.00	*11.50*	*55.00*	*10.00*
17456	12.16	5.12	3.36	11.50	58.41	9.45
17614	9.21	4.39	3.79	13.00	60.43	9.18
17660	9.55	4.65	3.37	11.88	60.50	10.05
17663	9.67	4.30	3.29	11.38	62.22	9.14
18809	9.52	4.94	2.61	11.69	61.34	9.90
			3.50	*10.00*	*57.50*	*12.00*
17423	12.17	2.13	2.77	13.00	69.34	.59
			3.50	*16.00*	*65.00*	*1.50*
17659	9.84	5.47	4.36	16.06	57.67	6.60
17522	9.72	5.86	5.37	15.94	56.39	6.72
17510	11.11	6.05	4.50	16.44	55.23	6.67
17508	10.42	5.94	4.72	17.00	55.03	6.89
17506	10.27	5.81	5.55	17.19	54.06	7.12
			3.50	*12.00*	*54.00*	*9.00*
17531	10.25	4.67	8.75	11.25	63.90	1.18
			5.50	*10.00*	*50.00*	*12.00*
17532	10.24	3.71	5.63	17.94	58.62	3.86
			3.50	*12.00*	*54.00*	*8.50*
17518	9.77	4.68	9.31	11.56	63.92	.76
			6.00	*12.00*	*55.00*	*7.00*
17610	11.49	1.59	3.21	12.38	69.07	2.26
			3.50	*10.00*	*60.00*	*6.00*
17673	10.03	3.77	5.67	13.63	59.05	7.85
17680	10.79	4.06	4.50	13.19	59.83	7.63
17683	10.17	4.10	4.16	12.38	61.05	8.14
			3.80	*12.00*	*58.00*	*8.90*
17514	11.63	4.50	3.68	13.88	59.87	6.44
17460	11.50	4.38	4.49	14.06	59.93	5.64
			3.50	*14.00*	*60.00*	*11.00*

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	KEMPER MILL & ELEVATOR CO. Kansas City, Mo.	
17407	Anchor Bran	J. F. Ruffin Co., New Augusta
		Guarantee
	KORNFALFA FEED MILLING CO., Kansas City, Mo.	
17412	Kornfalfa Feed	Union Naval Stores, Gulfport
17465	Kornfalfa Feed	J. S. Adkinson, McHenry
		Guarantee
	LANGENBERG HAY & GRAIN CO. New Orleans, La.	
17462	Wheat Bran	Hattiesburg Grocery Co., Hattiesburg
		Guarantee
17461	Wheat Shorts	Hattiesburg Grocery Co., Hattiesburg
		Guarantee
	LAWRENCE & HAMILTON FEED COMPANY, New Orleans, La.	
17439	Stafolife	J. L. Wells, Meridian
17484	Stafolife	A. Beer & Co., Natchez
		Guarantee
	LEXINGTON FLOUR MILLS, Lexington, Mo.	
17607	Wheat Bran	W. A. McDonald, Bay St. Louis
		Guarantee
	LIBERTY MILLS, Nashville, Tenn.	
17464	Wheat Bran	Picayune Feed & Fert. Co., Picayune
17515	Wheat Bran	Merchants Grocery Co., Hattiesburg
17612	Wheat Bran	Gulfport Grocery Co., Gulfport
		Guarantee
17678	Wheat Shorts	Greenwood Grocery Co., Greenwood
17516	Wheat Shorts	Merchants Grocery Co., Hattiesburg
17441	Wheat Shorts	Winner-Klein & Co., Meridian
17450	Wheat Shorts	R. W. Fagan & Co., Waynesboro
		Guarantee
	LUKENS MILLING COMPANY, Atchinson, Kans.	
17553	Wheat Bran	I. Lowenberg & Co., Natchez
		Guarantee
17552	Wheat Shorts	I. Lowenberg & Co., Natchez
		Guarantee

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17407	9.16	7.73	4.35	15.19	53.48	10.09
			4.00	*14.50*	*53.50*	*9.50*
17412	8.76	3.55	3.18	10.56	64.22	9.73
17465	10.84	4.47	3.95	11.00	60.28	9.46
			3.50	*11.00*	*60.00*	*12.00*
17462	10.84	5.74	4.22	13.88	58.22	7.10
			3.50	*14.00*	*54.00*	*10.00*
17461	11.53	4.73	5.21	17.50	56.72	4.31
			4.00	*16.00*	*56.00*	*9.00*
17439	8.96	12.02	5.56	11.06	51.07	11.33
17484	9.71	9.74	5.05	12.38	52.40	10.72
			6.00	*11.00*	*53.00*	*12.00*
17607	11.10	6.04	5.98	16.00	52.52	8.36
			3.57	*13.57*	*51.95*	*11.48*
17464	9.83	6.70	4.55	14.56	55.40	8.96
17515	9.97	6.55	4.57	14.81	55.14	8.96
17612	9.81	5.90	4.89	17.31	54.37	7.72
			4.00	*14.50*	*50.00*	*9.50*
17678	9.56	4.19	4.55	16.56	60.22	4.92
17516	10.67	4.39	4.99	16.75	57.86	5.34
17441	10.07	5.32	5.35	17.56	55.95	5.75
17450	11.04	5.50	5.38	16.75	55.66	5.67
			4.00	*16.00*	*48.00*	*6.00*
17553	10.21	6.84	4.35	16.00	52.70	9.90
			3.50	*11.00*	*50.00*	*12.00*
17552	10.39	4.91	4.75	17.13	56.83	5.99
			4.00	*13.00*	*55.00*	*9.00*

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	J. C. LYSLE MILLING CO., Leavenworth, Kans.	
17535	Wheat Bran	D. G. Patton & Co., Jackson
		Guarantee
17419	Wheat Shorts	C. W. Alexander, Montrose
		Guarantee
	MANEY MILLING COMPANY, Omaha, Neb.	
17619	Wheat Shorts	C. H. Stevens Co., Richton
		* Guarantee
	GEO. B. MATTHEWS & SONS, New Orleans, La.	
17503	Rice Polish	J. S. Allred & Sons, Hazlehurst
		Guarantee
	MEEK MILLING COMPANY, Marissa, Ill.	
17406	Wheat Bran and Ground Wheat Screenings	The Tate Co., Laurel
17429	Wheat Bran and Ground Wheat Screenings	Hitt, Hart & Blackston, Winona
17466	Wheat Bran and Ground Wheat Screenings	J. S. Adkinson, McHenry
		Guarantee
17467	Wheat Shorts	J. S. Adkinson, McHenry
17652	Wheat Shorts	W. H. Hurt & Co., Kilmichael
		Guarantee
	MILLSTADT MILLING CO., Millstadt, Ill.	
17448	Wheat Bran	Threefoot Bros. & Co., Meridian
		Guarantee
	MOHLENBROCK MILLING CO., Campbell Hill, Ill.	
17435	Wheat Bran	L. A. Sanderson, Vardaman
		Guarantee
	McDONALD HAY & GRAIN CO., Memphis, Tenn.	
†17634	Alfalfa Mixed Feed	Merchants Grocery Co., Water Valley
†18799	Alfalfa Mixed Feed	Merchants Grocery Co., Water Valley
17672	Alfalfa Mixed Feed	J. D. Roberts, Yazoo City
17679	Alfalfa Mixed Feed	Planters Supply Co., Greenwood
		Guarantee

* No guarantee submitted; sale illegal.

† Nos. 17634 and 18799 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17535	9.72	6.37	4.71	16.75	54.03	8.42
			4.00	*15.00*	*52.00*	*10.00*
17419	12.42	4.96	5.21	18.44	52.83	6.14
			4.50	*14.50*	*54.00*	*8.00*
17619	11.23	4.75	4.96	18.75	54.98	5.33
17503	9.71	3.83	9.79	12.63	62.75	1.29
			5.00	*10.00*	*50.00*	*12.00*
17406	9.19	7.74	4.23	15.00	55.32	8.52
17429	10.83	6.46	4.89	14.94	54.52	8.36
17466	9.68	6.68	5.32	15.56	54.42	8.34
			3.50	*13.50*	*50.00*	*12.00*
17467	12.08	3.06	4.34	14.69	62.88	2.95
17652	10.78	3.57	4.28	15.56	62.09	3.72
			3.50	*13.50*	*54.00*	*8.50*
17448	10.52	6.87	5.26	14.94	53.67	8.74
			3.50	*11.27*	*59.54*	*6.04*
17435	11.41	3.58	4.34	14.50	62.45	3 72
			3.50	*11.00*	*40.00*	*11.00*
17634	8.82	5.06	3.16	12.75	58.51	11.70
18799	8.67	4.91	3.19	11.19	60.47	11.57
17672	9.47	4.09	3.60	10.88	62.60	9.36
17679	8.83	3.67	3.70	10.63	63.09	10.08
			3.50	*10.00*	*58.00*	*12.00*

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	McINNIS & STURGIS, Meridian, Miss.	
17451	Rice Polish	R. W. Fagan & Co., Waynesboro
		Guarantee
17398	Mixed Rice Shorts	T. B. Gaddis, Morton
17445	Mixed Rice Shorts	Meyer Bros., Meridian
		Guarantee
	NATCHEZ VIDALIA RICE MILLING COMPANY, Natchez, Miss.	
17494	Rice Bran	I. Lowenberg & Co., Natchez
17485	Rice Bran	C. G. Miller, Natchez
		Guarantee
17488	Rice Polish	Geisenberger & Friedler, Natchez
17491	Rice Polish	I. Lowenberg & Co., Natchez
17554	Rice Polish	I. Lowenberg & Co., Natchez
		Guarantee
	NATIONAL FEED CO., St. Louis, Mo.	
17665	Wheat Bran	W. E. Laird, Hattiesburg
17685	Wheat Bran	The Goyer Co., Greenville
		Guarantee
17446	Wheat Middlings	Threefoot Bros. & Co., Meridian
17504	Wheat Middlings	J. S. Allred & Sons, Hazlehurst
17539	Wheat Middlings	Taylor-Wills Grocery Co., Jackson
17667	Wheat Middlings	W. E. Laird, Hattiesburg
17684	Wheat Middlings	The Goyer Co., Greenville
		Guarantee
	NATIONAL RICE MILLING CO., New Orleans, La.	
17408	Rice Bran	Gulfport Grocery Co., Gulfport
		Guarantee
*17627	Rice Polish	Barrett Grocery Co., Lexington
*18797	Rice Polish	Barrett Grocery Co., Lexington
†17624	Rice Polish	J. S. Allred & Son, Hazlehurst
†18795	Rice Polish	J. S. Allred & Son, Hazlehurst
‡18794	Rice Polish	Lotterhos & Huber Co., Crystal Sp'gs.
‡17622	Rice Polish	Lotterhos & Huber Co., Crystal Sp'gs.
*a*17544	Rice Polish	P. P. Williams & Co., Vicksburg
*a*18184	Rice Polish	P. P. Williams & Co., Vicksburg
*x*17517	Rice Polish	Merchants Grocery Co., Hattiesburg
*x*18181	Rice Polish	Merchants Grocery Co., Hattiesburg

*Nos. 17627 and 18797 were drawn from the same shipment.
† Nos. 17624 and 18795 were drawn from the same shipment.
‡ Nos. 18794 and 17622 were drawn from the same shipment.
a Nos. 17544 and 18184 were drawn from the same shipment.
x Nos. 17517 and 18181 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17451	10.32	4.41	8.88	11.25	64.38	.76
17398	8.13	10.05	9.46	11.50	50.89	9.97
17445	10.32	8.34	10.12	11.13	50.91	9.18
			5.00	*10.00*	*50.00*	*6.50*
17494	9.57	11.22	13.81	14.56	40.94	9.90
17485	10.24	10.27	12.40	14.00	44.61	8.48
			10.50	*12.00*	*42.00*	*12.00*
17488	10.96	5.74	10.54	12.25	59.77	.74
17491	10.65	6.59	8.24	12.06	61.61	.85
17554	10.90	6.97	10.26	10.88	59.93	1.06
			7.00	*11.00*	*65.00*	*2.50*
17665	8.32	6.66	4.22	14.56	57.76	8.48
17685	8.98	5.61	4.27	15.13	57.89	8.12
			4.00	*14.00*	*54.00*	*9.50*
17446	11.53	5.50	5.74	15.56	56.84	4.83
17504	10.88	4.27	4.70	17.50	57.85	4.80
17539	10.62	4.08	4.34	16.06	60.32	4.58
17667	10.40	4.10	5.42	16.50	57.20	6.38
17684	10.34	3.77	5.19	17.13	59.40	4.17
			4.00	*16.00*	*56.00*	*7.00*
17408	8.90	11.14	8.98	10.50	45.74	14.74
			10.25	*13.00*	*49.50*	*12.00*
17627	9.85	5.88	10.44	12.31	60.50	1.02
18797	7.99	5.36	9.70	11.75	64.25	.96
17624	9.88	5.66	9.75	12.19	61.52	1.00
18795	8.20	7.32	9.75	11.44	62.53	.76
18794	8.11	5.31	9.13	11.19	65.29	.97
17622	9.60	5.24	9.86	11.50	63.06	.74
17544	10.52	4.63	9.83	13.19	61.08	.75
18184	9.36	4.60	10.33	13.44	61.41	.86
17517	9.38	5.64	9.75	10.63	63.52	1.08
18181	9.79	5.76	9.50	10.81	63.06	1.08

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
*17452	Rice Polish	Dunnigan-Whitaker Co., Laurel
*18178	Rice Polish	Dunnigan-Whitaker Co., Laurel
17400	Rice Polish	Foote-Patrick Co., Laurel
		Guarantee
	NEW ATHENS MILLING CO., New Athens, Ill.	
17421	Middlings	Coleman Bros., Noxapater
17432	Middlings	Townsend & Shelton, Winona
		Guarantee
	NEW BASIN WAREHOUSE & ELEVATOR CO., New Orleans, La.	
†17454	Best-o-Feed	Ruffin Mercantile Co., Ellisville
†18180	Best-o-Feed	Ruffin Mercantile Co., Ellisville
▶17404	Best-o-Feed	Buckley Terry Co., Laurel
‡17453	Best-o-Feed	Hand Bros., Ellisville
‡18179	Best-o-Feed	Hand Bros., Ellisville
		a Guarantee
	NUTRILINE MILLING CO., Crowley, La.	
17608	Nutriline	W. A. McDonald, Bay St. Louis
		Guarantee
	G. E. PATTESON & COMPANY, Memphis, Tenn.	
17690	Sugaration Stock Feed	The Goyer Co., Greenville
		Guarantee
	GEO. P. PLANT MILLING CO., St. Louis, Mo.	
17483	Wheat Bran	A. Beer & Co., Natchez
17487	Wheat Bran	Geisenberger & Friedler, Natchez
17493	Wheat Bran	I. Lowenberg & Co., Natchez
17495	Wheat Bran	Rumble & Wensel Co., Natchez
17560	Wheat Bran	Postlethwaite Stewart Co., Natchez
17615	Wheat Bran	Gulfport Grocery Co., Gulfport
		Guarantee
17414	Wheat Middlings	M. M. Moody, Long Beach
17482	Wheat Middlings	A. Beer & Co., Natchez
17492	Wheat Middlings	I. Lowenberg & Co., Natchez
17549	Wheat Middlings	A. Beer & Co., Natchez
17559	Wheat Middlings	Rumble & Wensel Co., Natchez
		Guarantee

* Nos. 17452 and 18178 were drawn from the same shipment.
† Nos. 17454 and 18180 were drawn from the same shipment.
‡ Nos. 17453 and 18179 were drawn from the same shipment.
a No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17452	10.60	6.80	10.38	11.50	59.01	1.71
18178	10.41	5.50	9.80	11.75	61.19	1.35
17400	7.59	4.37	9.34	11.81	65.97	.92
			11.00	*11.63*	*60.05*	*1.60*
17421	11.25	4.14	3.88	15.94	62.87	1.92
17432	10.82	2.50	3.62	15.38	65.90	1.78
			3.50	*13.50*	*55.00*	*8.00*
17454	10.41	3.38	4.70	10.44	64.93	6.14
18180	11.36	6.44	5.08	12.69	52.08	12.35
17404	10.15	3.59	3.75	10.81	65.10	6.60
17453	11.61	5.12	4.67	11.38	58.07	9.15
18179	12.13	4.35	3.65	11.38	61.32	7.17
17608	10.88	7.58	8.48	12.94	52.32	7.80
			3.50	*12.00*	*58.00*	*10.00*
17690	8.84	5.88	3.89	12.50	60.63	8.26
			3.50	*11.65*	*64.00*	*11.04*
17483	10.37	6.95	4.45	17.38	53.03	7.82
17487	9.80	6.91	4.39	17.81	53.12	7.97
17493	9.50	6.14	4.14	18.00	54.04	8.18
17495	8.71	6.62	4.58	19.00	52.61	8.48
17560	11.50	6.42	4.97	16.44	55.60	5.07
17615	9.76	6.58	4.36	17.31	52.87	9.12
			4.00	*16.00*	*54.00*	*9.00*
17414	8.37	6.68	5.31	18.13	56.78	4.73
17482	10.14	5.20	5.42	20.00	54.51	4.73
17492	9.24	4.96	4.42	20.06	56.47	4.85
17549	10.75	5.00	5.00	18.25	55.79	5.21
17559	11.54	5.02	4.68	17.88	53.37	7.51
			4.41	*17.11*	*59.18*	*5.18*

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	THE QUAKER OATS CO., Chicago, Ill.	
17468	Banner Feed	Gaddis & McLaurin, Bolton
17486	Banner Feed	R. Viener & Co., Natchez
17489	Banner Feed	Geisenberger & Friedler, Natchez
17500	Banner Feed	Gaddis & McLaurin, Raymond
17541	Banner Feed	Gaddis & McLaurin, Bolton
17551	Banner Feed	R. Viener & Co., Natchez
17676	Banner Feed	Greenwood Grocery Co., Greenwood
17681	Banner Feed	Clark, Herrin, Campbell Co., Cl'ksdale
17691	Banner Feed	Mississippi Feed Co., Greenville
		Guarantee
17474	Schumacher Chick Feed	P. P. Williams Co., Vicksburg
		Guarantee
*17662	Schumacher Special Horse Feed	Stewart & Hemeter, Seminary
*18808	Schumacher Special Horse Feed	Stewart & Hemeter, Seminary
		Guarantee
17523	Work More Feed	R. H. Green & Bros., Jackson
		x Guarantee
	RALSTON PURINA COMPANY, St. Louis, Mo.	
17496	Purina Feed	Rumble & Wensel Co., Natchez
17527	Purina Feed	Capital Grocery Co., Jackson
17542	Purina Feed	Chas. Halsmith, Bolton
†17558	Purina Feed	Rumble & Wensel Co., Natchez
†18186	Purina Feed	Rumble & Wensel Co., Natchez
17669	Purina Feed	Yazoo Grocery Co., Yazoo City
17689	Purina Feed	The Goyer Co., Greenville
		Guarantee
‡17666	Purina Molasses Feed	W. E. Laird, Hattiesburg
‡18810	Purina Molasses Feed	W. E. Laird, Hattiesburg
		Guarantee
17547	Poultry Feed, Chick Size	W. O. Worrell, Vicksburg
17664	Poultry Feed, Chick Size	Hattiesburg Grocery Co., Hattiesburg
17686	Poultry Feed, Chick Size	The Goyer Co., Greenville
17529	Poultry Feed, Scratch Size	Capital Grocery Co., Jackson
		Guarantee
*a*17519	Success Ox Feed	Hattiesburg Grocery Co., Hattiesburg
*a*18182	Success Ox Feed	Hattiesburg Grocery Co., Hattiesburg
		x Guarantee
	RICKERTS RICE MILLS, New Orleans, La.	
17540	Rice Polish	Taylor-Wills Grocery Co., Jackson
		Guarantee

* Nos. 17662 and 18808 were drawn from the same shipment.
† Nos. 17558 and 18186 were drawn from the same shipment.
‡ Nos. 17666 and 18810 were drawn from the same shipment.
a Nos. 17519 and 18182 were drawn from the same shipment.
x No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17468	11.73	3.30	4.10	10.44	63.81	6.62
17486	10.01	3.62	3.77	11.88	64.49	6.23
17489	9.98	4.74	4.11	12.38	61.69	7.10
17500	9.99	3.25	2.97	11.81	64.72	7.26
17541	9.70	3.63	3.75	10.13	65.25	7.54
17551	10.97	3.81	3.35	9.75	64.21	7.91
17676	8.77	3.39	3.76	10.69	66.14	7.25
17681	8.49	3.50	3.78	9.88	66.75	7.60
17691	8.25	3.71	3.87	9.81	65.69	8.67
			3.75	*9.75*	*63.00*	*10.50*
17474	12.35	1.75	3.34	12.63	67.97	1.96
			3.50	*10.00*	*60.00*	*5.00*
17662	9.39	2.72	3.60	10.13	68.19	5.97
18808	10.28	3.09	3.55	10.00	67.70	5.38
			4.00	*10.00*	*62.00*	*8.00*
17523	10.35	4.50	3.50	10.63	61.36	9.66
17496	9.76	3.80	4.52	15.19	58.43	8.30
17527	11.35	4.75	4.59	13.06	59.21	7.04
17542	10.54	4.45	4.41	13.06	59.62	7.92
17558	12.12	4.21	3.45	14.25	59.64	6.33
18186	10.80	4.02	4.53	14.13	59.24	7.28
17669	11.55	3.77	4.05	12.75	60.26	7.62
17689	9.58	3.56	4.41	12.75	62.27	7.43
			4.00	*12.50*	*53.00*	*8.90*
17666	8.03	5.57	4.03	11.56	63.80	7.01
18810	9.87	6.00	3.50	11.69	61.91	7.03
			4.50	*11.50*	*59.00*	*10.00*
17547	12.02	2.31	3.84	10.88	68.26	2.69
17664	10.72	1.64	3.79	11.19	70.29	2.37
17686	10.39	1.93	3.66	10.81	70.58	2.63
17529	12.44	1.65	3.67	11.19	68.63	2.42
			3.60	*11.00*	*65.00*	*4.00*
17519	11.28	4.57	4.58	12.75	61.25	5.57
18182	12.77	4.87	3.00	12.88	60.64	5.84
17540	9.79	3.78	8.57	11.63	64.89	1.34
			8.00	*11.00*	*60.00*	*2.00*

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	N. SAUERS MILLING CO., Cherryvale, Kans.	
17469	Wheat Bran	Sol Fried, Vicksburg
17545	Wheat Bran	C. J. Edwards & Co., Vicksburg Guarantee
	SOUTHERN RICE MILLING CO., New Orleans, La.	
17427	Rice Polish	The Barrett Grocery Co., Lexington
17536	Rice Polish	D. G. Patton & Co., Jackson
17671	Rice Polish	Yazoo Grocery Co., Yazoo City * Guarantee
	STAFOLIFE FEED & MILLING COMPANY, New Orleans, La.	
17409	Gulfport Horse and Mule Feed	Gulfport Feed Store, Gulfport * Guarantee
17505	Nolean Horse & Mule Feed	Lampton Bros. Co., Tylertown Guarantee
17657	Stafolife	Lampton Bros. Co., Tylertown
17616	Stafolife	Biloxi Milling Co., Biloxi
17609	Stafolife	W. A. McDonald, Bay St. Louis
17548	Stafolife	A. Beer & Co., Natchez
17528	Stafolife	Capital Grocery Co., Jackson
17520	Stafolife	W. E. Laird, Hattiesburg
17463	Stafolife	W. E. Laird, Hattiesburg
17401	Stafolife	Foote Patrick Co., Laurel Guarantee
17410	Stafolife Poultry Feed	Gulfport Feed Store, Gulfport Guarantee
	STANARD-TILTON MILLING CO., St. Louis, Mo.	
17645	Wheat Middlings	J. J. Rogers & Son, Tupelo Guarantee
	STAR RICE MILLING CO., New Orleans, La.	
17403	Rice Polish	Dunagin-Whitaker Co., Laurel Guarantee
	STEINHARDT & COMPANY, New Orleans, La.	
17459	Rice Polish	Merchants Grocery Co., Hattiesburg * Guarantee
	ST. MARY'S MILLS COMPANY, St. Mary's, Mo.	
17437	Wheat Shorts	Mathiston Mercantile Co., Mathiston Guarantee

* No guaranteed submitteed; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17469	11.38	6.04	4.90	16.50	53.30	7.88
17545	11.43	5.81	4.75	15.69	54.89	7.43
			3.50	*14.26*	*55.18*	*8.80*
17427	9.87	4.10	10.51	11.19	62.76	1.57
17536	9.91	5.22	10.99	12.69	60.28	.91
17671	9.37	4.40	9.52	11.38	64.63	.70
17409	9.13	8.52	4.65	10.63	52.07	15.00
17505	10.28	8.97	5.56	12.75	51.00	11.44
			5.00	*11.00*	*53.00*	*12.00*
17657	9.74	9.98	6.00	11.13	52.30	10.85
17616	10.93	8.83	5.44	10.75	53.93	10.12
17609	10.67	9.24	5.89	12.38	50.87	10.95
17548	10.73	10.10	5.14	12.00	50.47	11.56
17528	10.37	9.20	6.64	11.56	52.62	9.61
17520	9.84	10.14	6.73	12.75	51.07	9.47
17463	9.76	8.87	6.28	12.06	52.29	10.74
17401	8.18	10.15	5.79	11.44	54.17	10.27
			5.00	*11.00*	*53.00*	*12.00*
17410	9.16	1.63	3.89	10.13	73.21	1.98
			4.00	*10.00*	*60.00*	*6.00*
17645	10.03	4.44	5.04	18.25	56.62	5.62
			5.00	*16.00*	*40.00*	*7.00*
17403	7.88	5.17	11.73	12.00	62.52	.70
			6.00	*12.00*	*65.00*	*1.00*
17459	9.90	6.15	12.03	13.25	57.17	1.50
17437	11.83	5.46	5.42	17.19	57.08	3.02
			4.20	*15.81*	*62.37*	*2.90*

TABLE I.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	TENNESSEE FIBRE CO., Memphis, Tenn.	
17655	Cremo Brand Feed Meal "Cow and Ox"	W. G. Francis, Nettleton
17647	Cremo Brand Feed Meal "Cow and Ox"	Wesson & Stovall, Saltillo
17644	Cremo Brand Feed Meal "Cow and Ox"	J. J. Rogers & Son, Tupelo
17411	Cremo Brand Feed Meal "Cow and Ox"	Union Naval Stores, Gulfport Guarantee
	VALIERS & SPIES MILLING COMPANY, St. Louis, Mo.	
17428	Valier's Middlings	Small & Moore, Winona Guarantee
	VALLEY MILLING COMPANY, St. Louis, Mo.	
17555	Delta Feed	I. Lowenberg & Co., Natchez Guarantee
	WATERLOO MILLING CO., Waterloo, Ill.	
17643	Wheat Bran	Tupelo Grocery Co., Tupelo Guarantee
17642	Wheat Middlings	Tupelo Grocery Co., Tupelo Guarantee
	WEBB & MAURY, Memphis, Tenn.	
17443	Dixie Hen Feed	Winner Klein & Co., Meridian * Guarantee
17440	Riverside Dairy Feed	Winner Klein & Co., Meridian Guarantee
	YATES & DONELSON COMPANY, Memphis, Tenn.	
17524	Wheat Bran	R. H. Green & Bro., Jackson Guarantee
17674	Wheat Bran Mixed with Corn Bran	Greenwood Grocery Co., Greenwood
17668	Wheat Bran Mixed with Corn Bran	Yazoo Grocery Co., Yazoo City Guarantee
17525	Gray Shorts	R. H. Green & Bro., Jackson * Guarantee

* No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

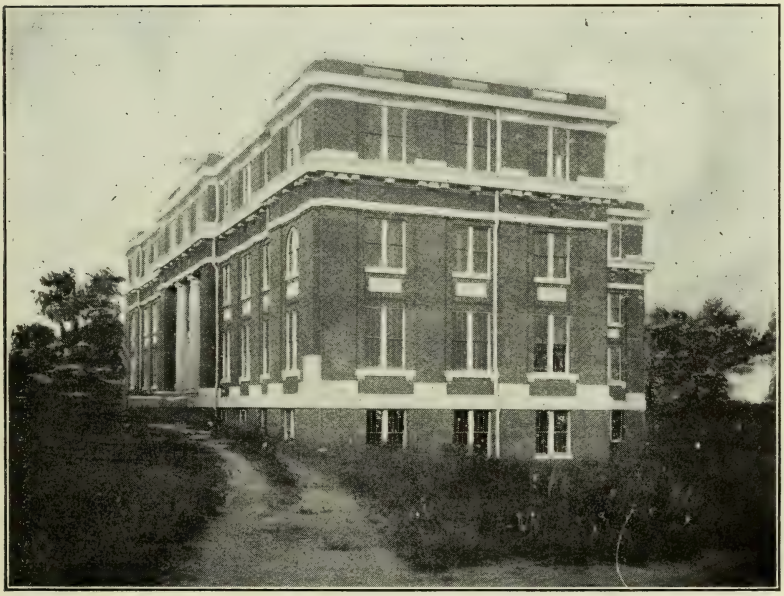
Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17655	7.93	5.08	5.97	24.19	37.63	19.20
17647	9.14	4.92	5.10	21.38	37.93	21.53
17644	7.92	4.57	5.19	23.69	38.07	20.56
17411	7.02	4.88	6.23	23.81	38.61	19.45
			5.00	*20.00*	*36.00*	*25.00*
17428	10.91	5.40	6.38	17.63	54.67	5.01
			5.00	*16.00*	*50.00*	*8.00*
17555	10.88	3.87	4.94	9.63	61.10	9.58
			4.25	*9.25*	*50.00*	*12.00*
17643	8.88	6.95	4.80	16.69	54.10	8.58
			4.00	*15.00*	*50.00*	*8.25*
17642	9.99	4.01	5.69	17.31	58.86	4.14
			4.00	*15.00*	*60.00*	*4.00*
17443	11.09	2.07	4.10	11.44	68.03	3.27
17440	8.81	8.92	6.56	19.69	43.51	12.51
			4.00	*18.00*	*45.00*	*14.00*
17524	10.24	5.69	3.95	15.13	57.91	7.08
			3.58	*14.85*	*54.60*	*10.00*
17674	9.48	4.26	3.96	12.94	62.42	6.94
17668	10.04	4.96	4.47	13.81	58.93	7.79
			3.70	*13.25*	*57.15*	*10.00*
17525	10.90	4.75	5.48	16.88	56.74	5.25

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

BULLETIN NO. 153.

INSPECTION AND ANALYSES OF COMMERCIAL FEEDINGSTUFFS

ON SALE IN THE STATE



CHEMICAL LABORATORY

AGRICULTURAL COLLEGE, MISSISSIPPI
NOVEMBER, 1911

MISSISSIPPI FERTILIZER AND FEEDING STUFF CONTROL

INSPECTION AND ANALYSES OF FEEDING STUFFS.

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*Resigned November 1, 1911.

INSPECTION AND ANALYSES
—OF—
COMMERCIAL FEEDING STUFFS.

Season 1910-1911.

This bulletin contains analyses of 271 samples of commercial feeding stuffs. The analyses represent shipments to almost all parts of the State. No care is spared by inspectors in taking samples, and the results of the analytical work should be worthy of careful consideration by feeders and dealers in feeding stuffs.

The feeding stuffs law has been in effect since July, 1908. Many analyses showing the composition of all kinds of feed have been published in these bulletins which have been widely distributed. These analyses bring out in a very certain way the variations which exist in the nutrients contained in the feeding stuffs and mixed feed found in the markets.

Suggestions concerning the purchase of feeds have been published in previous bulletins. There are several considerations to be taken into account by the discriminating buyer. He ought to know:

1. The Kind of Feed which He Should Buy. A discussion of functions of feed nutrients, composed of feeding stuffs, digestibility, feeding standards, computation of rations, etc., etc., will be found in Bulletin No. 144, which was distributed last December. Each feeder must decide for himself the character of feeding stuffs he must buy for use in connection with home grown feeds that his animals may be given palatable and properly proportioned rations at the lowest possible cost.

2. The Guaranteed Analysis of the Feeds which Are Offered. A tag showing the seller's guarantee is attached to each bag of feed sold in this state. This tag shows also the number of pounds of feed in the bag and the name and address of the guarantor. Feeds must be true to name. Wheat bran, shorts, rice polish and bran, etc., etc., must be sold unmixed with any foreign product whatever. Mixtures of products must be marketed as mixed feeds.

3. The Products of which Mixed Feeds Are Made. This information should be given on the guarantor's tag. The law now in force does not require it. The purchaser is able to form a better judgment of the digestibility and palatability of a feed mixture if he knows the materials which compose it. Viable weed seeds may add to the stock of weeds already about the premises and on the farm.

4. Whether Analyses in These Bulletins Show that the Sellers Supply Feed Well Above Their Guaranties. In buying any feed, it is important to consult these analyses. The tables will show that some manufacturers are conservative in making guarantees, and it remains for the analyses of samples of shipments to show that the feed supplied is usually much better than the guaranteed analyses indicates. On the other hand certain brands of feed often barely meet the guarantee and frequently fall below it. These analyses will show the buyer what he may expect in actual delivery.

5. That the Price Asked Bears a Proper Relation to the Fat, Protein, and Carbohydrates Contained in the Feed. The buyer desires to obtain, of course, the best possible feed for the money. Mixed feeds especially vary greatly in composition, and there should be also a variation in the price asked for them. Feeds rich in fat and protein associated with small percentages of fiber cannot be had for a low price per ton. The quality of the feed as indicated by guaranties and analysis must be known before the buyer may determine whether the price per ton asked is a reasonable one. He may be able to buy a ton of a better feed for the same amount of money.

Results of the Inspection. A general summary of the results of the inspection for the entire season will appear in a bulletin which will be ready for the press in a short time. The table of analyses shows also the guaranties and the actual composition of the feeds can be readily compared therewith. Proceedings will be instituted against those sellers who insist upon shipping feeds shown to be deficient by these analyses.

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number	Name of Brand and Manufacturer.	Where and from Whom Collected.
	AKIN-ERSKINE MILLING CO., Evansville, Ind.	
18249	Shorts	Merchants' Grocery Co., Brookhaven
		Guarantee
	ARKADELPHIA MILLING CO., Arkadelphia, Ark.	
18199	Wheat Bran	D. W. Wilkinson & Bro., Jackson
		Guarantee
18198	Shorts	D. W. Wilkinson & Bro., Jackson
		Guarantee
	AUNT PATSY POUL. FEED COMPANY, Memphis, Tenn.	
18545	Aunt Patsy's Poultry Feed	Merchants Grocery Co., Hattiesburg
18254	Aunt Patsy's Poultry Feed	Merchants Gro. Co., Crystal Springs
18333	Aunt Patsy's Poultry Feed	Hannah Distributing Co., Jackson
		*Guarantee
18334	Aunt Patsy's Scratch Feed	Hannah Distributing Co., Jackson
18544	Aunt Patsy's Scratch Feed	Merchants Grocery Co., Hattiesburg
		*Guarantee
	AURORA MILLING CO., Aurora, Mo.	
17706	Aurora Mixed Feed	W. H. Prichartt & Co., Natchez
18522	Aurora Mixed Feed	W. H. Prichartt & Co., Natchez
		Guarantee
18523	Wheat Shorts	W. H. Prichartt & Co., Natchez
18245	Wheat Shorts	W. H. Prichartt & Co., Natchez
		Guarantee
	BALLARD & BALLARD CO., Louisville, Ky.	
18213	Ballard's Bran	Ballard & Ballard Co., Jackson
		Guarantee
18212	Ballard's Shipstuff	Ballard & Ballard Co., Jackson
		Guarantee
	BROOKHAVEN COTTON OIL & FERTILIZER COMPANY, Brookhaven, Miss.	
18251	Hossfalfa	Brookhaven Cot. Oil & Fert. Co., Brookhaven
18524	Hossfalfa	Charles Edler, Brookhaven
		Guarantee

*No guarantee submitted; sale illegal.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18249	9.12	4.60	5.07	17.13	58.20	5.88
			4.50	*16.36*	*62.66*	*3.90*
18199	9.96	6.56	4.77	15.00	54.85	8.86
			3.50	*12.00*	*50.00*	*12.00*
18198	10.31	4.65	5.74	17.19	57.38	4.73
			3.50	*12.00*	*50.00*	*12.00*
18545	8.27	11.95	4.34	16.25	51.93	7.26
18254	7.81	12.04	5.47	16.88	50.34	7.46
18333	7.18	10.52	4.71	16.38	52.81	8.40
18334	7.47	7.29	3.30	10.75	68.22	2.97
18544	9.64	6.43	3.23	10.81	66.66	3.23
17706	10.07	5.09	4.59	16.00	57.84	6.41
18522	11.31	4.64	4.59	15.94	57.10	6.42
			3.50	*16.00*	*53.00*	*10.00*
18523	9.93	3.52	5.00	16.56	61.55	3.44
18245	10.36	2.21	4.83	16.25	63.68	2.67
			4.00	*15.00*	*60.00*	*8.00*
18213	8.94	6.29	5.11	15.75	55.88	8.03
			4.10	*14.44*	*50.00*	*9.00*
18212	9.50	3.37	4.65	16.75	61.88	3.85
			3.75	*15.69*	*55.00*	*6.87*
18251	10.03	5.15	5.55	12.75	55.37	11.15
18524	9.52	6.00	5.97	13.00	54.25	11.26
			3.50	*11.50*	*52.00*	*12.00*

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	BROWDER MILLING CO., Fulton, Ky.	
18526	Mixed Feed	W. F. Funchess & Co., Osyka
		Guarantee
	CHARLESTON MILLING CO., Charleston, Mo.	
18346	Shipstuff	A. J. Lewis, Edwards
		Guarantee
	CORNO MILLS COMPANY, St. Louis, Mo.	
17733	Corno Chick Feed	Hannah Distributing Co., Jackson
18216	Corno Chick Feed	Hannah Distributing Co., Jackson
18326	Corno Chick Feed	Barrett Grocery Co., Lexington
		Guarantee
17732	Corno Hen Feed	Hannah Distributing Co., Jackson
18215	Corno Hen Feed	Hannah Distributing Co., Jackson
		Guarantee
17697	Corno Horse & Mule Feed	P. P. Williams Co., Vicksburg
17704	Corno Horse & Mule Feed	Postlethwaite & Stewart Co., Natchez
17734	Corno Horse & Mule Feed	Hannah Distributing Co., Jackson
18214	Corno Horse & Mule Feed	Hannah Distributing Co., Jackson
18231	Corno Horse & Mule Feed	P. P. Williams Co., Vicksburg
18243	Corno Horse & Mule Feed	Postlethwaite & Stewart Co., Natchez
18258	Corno Horse & Mule Feed	Merchants Grocery Co., Hazlehurst
18261	Corno Horse & Mule Feed	W. A. McDonald, Bay St. Louis
18309	Corno Horse & Mule Feed	The Goyer Co., Greenville
18319	Corno Horse & Mule Feed	Greenwood Grocery Co., Greenwood
18320	Corno Horse & Mule Feed	Greenwood Grocery Co., Greenwood
18325	Corno Horse & Mule Feed	Barrett Grocery Co., Lexington
18335	Corno Horse & Mule Feed	Hannah Distributing Co., Jackson
18345	Corno Horse & Mule Feed	A. J. Lewis, Edwards
18521	Corno Horse & Mule Feed	Postlethwaite & Stewart Co., Natchez.
18531	Corno Horse & Mule Feed	Holloway & McRaney, Collins
		Guarantee
	DAHNKE-WALKER MILLING COMPANY, Union City Tenn.	
18566	Wheat Bran	McInnis & Sturgis, Meridian
		Guarantee
	DAVIS & ANDREWS CO., Memphis, Tenn.	
18248	Corn Chops	J. L. Wells, Meridian
		Guarantee

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18526	10.40	5.23	5.38	15.00	57.66	6.33
			4.25	*15.00*	*54.00*	*9.00*
18346	10.07	3.94	4.26	14.63	63.56	3.54
			5.20	*14.35*	*60.20*	*4.50*
17733	11.54	1.67	2.89	10.38	71.66	1.86
18216	9.06	1.72	3.52	10.75	72.73	2.22
18326	8.16	1.57	3.30	10.69	74.46	1.82
			3.50	*10.00*	*70.00*	*3.40*
17732	10.53	1.35	3.53	10.25	72.35	1.99
18215	8.86	1.33	3.69	10.13	74.13	1.86
			3.50	*10.00*	*68.00*	*5.00*
17697	8.81	4.70	4.03	11.19	59.29	11.98
17704	9.84	4.47	4.29	11.31	59.00	11.09
17734	9.49	4.13	3.71	10.50	62.23	9.94
18214	7.86	3.66	4.26	10.63	63.32	10.27
18231	7.37	4.10	4.02	11.50	63.24	9.77
18243	6.86	3.95	4.05	11.06	64.32	9.76
18258	8.93	3.98	4.28	10.75	61.76	10.30
18261	8.45	4.09	3.68	11.13	61.81	10.84
18309	10.31	3.62	4.24	10.44	61.78	9.61
18319	7.42	4.09	4.06	10.75	64.26	9.42
18320	7.57	4.25	4.38	10.63	62.67	10.50
18325	8.72	3.83	4.01	11.13	62.88	9.43
18335	9.66	3.98	3.69	11.31	62.36	9.00
18345	10.52	3.83	3.82	10.56	62.44	8.83
18521	9.66	4.24	4.05	11.13	59.10	11.82
18531	9.97	3.84	3.52	10.63	61.04	11.00
			3.50	*10.00*	*58.50*	*12.00*
18566	8.48	6.35	4.79	14.69	57.83	7.86
			3.95	*14.00*	*55.00*	*10.50*
18248	10.56	3.72	4.20	9.31	70.65	1.56

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	C. A. DAMMANN & CO., Memphis, Tenn.	
18546	Aunt Patsy's Cow Feed	Merchants Grocery Co., Hatiesburg
18563	Aunt Patsy's Cow Feed	A. J. Lyons & Co., Meridian
		* Guarantee
	DOMESTIC FLOUR MILLING COMPANY., Kansas City, Mo.	
18230	Wheat Bran	P. P. Williams Co., Vicksburg
18294	Wheat Bran	Winner Klein Co., Meridian
18541	Wheat Bran	Merchants Grocery Co., Hattiesburg
		Guarantee
17713	Wheat Middlings	J. K. Dunn, McComb
18293	Wheat Middlings	Winner Klein Co., Meridian
18543	Wheat Middlings	Merchants Grocery Co., Hattiesburg
18564	Wheat Middlings	A. J. Lyons & Co., Meridian
		Guarantee
	EDGAR-MORGAN COMPANY, New Orleans, La.	
18246	Ceralfa Stock Feed	W. H. Prichartt & Co., Natchez
18299	Ceralfa Stock Feed	J. C. McClinton, Newton
18308	Ceralfa Stock Feed	The Goyer Co., Greenville
18324	Ceralfa Stock Feed	Durant Ice & Coal Co., Durant
18303	Ceralfa Stock Feed	Yazoo Grocery Co., Yazoo City
		Guarantee
	EMPIRE RICE MILL CO., New Orleans, La.	
17710	Rice Polish	J. S. Allred & Son, Hazlehurst
		Guarantee
	THE A. H. GEORGE CO. Meridian, Miss.	
18536	George's Prepared Ox Feed	G. B. Hall, Columbia
		Guarantee
	GREAT WESTERN CEREAL COMPANY, Chicago, Ill.	
†17722	Boss Feed	Merchants Grocery Co., Brookhaven
†18814	Boss Feed	Merchants Grocery Co., Brookhaven

* No guarantee submitted; sale illegal.

† Nos. 17722 and 18814 were drawn from the same shipment.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18546	9.05	5.53	3.50	14.56	51.51	15.85
18563	9.08	6.49	4.46	15.44	47.67	16.86
18230	8.36	8.71	5.47	15.94	52.71	8.81
18294	7.71	6.42	4.95	16.38	56.18	8.36
18541	10.16	6.45	5.23	16.75	52.95	8.46
			4.00	*14.50*	*56.00*	*10.00*
17713	9.60	5.24	5.19	18.88	55.03	6.06
18293	9.19	4.36	5.74	17.50	58.16	5.05
18543	10.17	4.33	5.34	18.06	56.88	5.22
18564	10.46	4.53	5.18	18.19	56.31	5.33
			4.00	*15.00*	*56.00*	*7.00*
18246	8.43	6.31	3.84	14.63	57.70	9.09
18299	8.15	7.27	4.40	14.00	58.20	7.98
18308	11.22	6.32	4.36	12.50	57.30	8.30
18324	7.78	6.11	4.02	13.94	58.83	9.32
18303	8.51	6.16	4.15	12.94	59.23	9.01
			4.00	*13.00*	*55.00*	*11.50*
17710	9.13	5.25	10.00	11.56	63.06	1.00
			7.50	*10.50*	*65.42*	*1.25*
18536	9.26	3.42	2.94	9.69	40.95	33.74
			4.00	*11.00*	*38.00*	*40.00*
17722	10.34	3.81	3.52	11.31	62.66	8.36
18814	11.76	3.66	2.18	11.56	63.21	7.63

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17724	Boss Feed	W. R. Newman, Raymond
17735	Boss Feed	Taylor-Wills Grocery Co., Jackson
18222	Boss Feed	Taylor-Wills Grocery Co., Jackson
18224	Boss Feed	Sol Freid Co., Vicksburg
18247	Boss Feed	Merchants Grocery Co., Brookhaven
18302	Boss Feed	Yazoo Grocery Co., Yazoo City
18315	Boss Feed	W. S. Campbell, Clarksdale
18322	Boss Feed	Grenada Grocery Co., Grenada
		Guarantee
18239	Durham Feed	I. Lowenberg & Co., Natchez
*18328	Durham Feed	D. W. Wilkinson & Bro., Jackson
*18856	Durham Feed	D. W. Wilkinson & Bro., Jackson
18518	Durham Feed	I. Lowenberg & Co., Natchez
		Guarantee
18207	Excelsior Feed	R. H. Green & Bro., Jackson
18331	Excelsior Feed	R. H. Green & Bro., Jackson
18343	Excelsior Feed	Mellon Bros., Bolton
		Guarantee
†18201	Maizefalfa Feed	D. W. Wilkinson & Bro., Jackson
†18816	Maizefalfa Feed	D. W. Wilkinson & Bro., Jackson
18327	Maizefalfa Feed	D. W. Wilkinson & Bro., Jackson
		Guarantee
§18221	Mazo Feed	Taylor-Wills Grocery Co., Jackson
§18818	Mazo Feed	Taylor-Wills Grocery Co., Jackson
a18248	Mazo Feed	Merchants Grocery Co., Brookhaven
a18820	Mazo Feed	Merchants Grocery Co., Brookhaven
		Guarantee
d17725	Sterling Chick Feed	R. H. Green & Bro., Jackson
d18815	Sterling Chick Feed	R. H. Green & Bro., Jackson
		Guarantee
18323	Sterling Scratching Grains	Grenada Grocery Co., Grenada
		Guarantee
	GREAT WESTERN FEED CO. St. Louis, Mo.	
17715	Purity Horse & Cattle Feed	W. F. Funchess & Co., Osyka
x17721	Purity Horse & Cattle Feed	Chas. Edler Grocery Co., Brookhaven
x18813	Purity Horse & Cattle Feed	Chas. Edler Grocery Co., Brookhaven
y18525	Purity Horse & Cattle Feed	W. F. Funchess & Co., Osyka
y18858	Purity Horse & Cattle Feed	W. F. Funchess & Co., Osyka
		Guarantee

* Nos. 18328 and 18856 were drawn from the same shipment.
† Nos. 18201 and 18816 were drawn from the same shipment.
§ Nos. 18221 and 18818 were drawn from the same shipment.
a Nos. 18248 and 18820 were drawn from the same shipment.
d Nos. 17725 and 18815 were drawn from the same shipment.
x Nos. 17721 and 18813 were drawn from the same shipment.
y Nos. 18525 and 18858 were drawn from the same shipment.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17724	9.35	2.99	4.13	10.75	66.11	6.67
17735	9.07	2.63	4.58	9.69	68.38	5.65
18222	8.22	3.21	4.56	10.19	67.46	6.36
18224	8.79	2.77	4.46	10.88	67.51	5.59
18247	7.95	2.34	4.32	10.19	70.24	4.96
18302	7.26	4.84	4.14	9.56	66.58	7.62
18315	7.75	3.14	4.35	9.94	67.27	7.55
18322	6.85	4.50	4.17	10.56	67.11	6.81
			4.00	*9.50*	*60.00*	*10.00*
18239	8.58	2.89	4.10	9.38	66.91	8.14
18328	6.50	2.87	3.88	9.00	72.13	5.62
18856	7.71	3.82	4.39	9.44	68.55	6.09
18518	7.98	3.05	4.53	10.31	66.27	7.86
			4.00	*9.50*	*60.00*	*10.00*
18207	8.32	2.89	4.00	9.25	67.89	7.65
18331	5.80	3.14	4.02	10.31	68.92	7.81
18343	9.67	3.21	4.00	9.69	66.02	7.41
			4.00	*9.50*	*60.00*	*10.00*
18201	8.96	3.63	3.70	10.19	62.72	9.90
18816	11.55	4.35	3.03	9.81	59.45	11.81
18327	6.66	4.25	4.20	11.31	64.48	9.10
			4.00	*10.00*	*60.00*	*11.00*
18221	8.20	5.05	3.47	10.44	64.30	8.54
18818	10.10	4.46	4.11	10.69	61.78	8.86
18248	7.67	4.40	3.80	11.31	64.50	8.32
18820	10.04	3.55	3.62	11.25	63.00	8.54
			4.00	*10.00*	*60.00*	*11.00*
17725	9.79	1.47	3.12	10.81	72.86	1.95
18815	12.09	2.00	2.96	11.56	69.84	1.55
			3.50	*10.00*	*65.00*	*4.00*
18323	9.22	1.65	3.62	10.88	72.75	1.88
			3.50	*10.00*	*65.00*	*4.00*
17715	9.84	4.81	3.21	11.44	57.99	12.71
17721	10.37	3.77	3.16	10.56	62.12	10.02
18813	9.92	4.68	2.90	12.63	60.32	9.55
18525	9.75	5.12	3.28	12.13	28.87	10.85
18858	9.78	5.02	3.34	11.31	57.88	12.67
			4.00	*11.50*	*55.00*	*10.00*

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	GULFPORT GROCERY CO., Gulfport, Miss.	
18270	Mile Post Feed	Gulfport Grocery Co., Gulfport
18532	Mile Post Feed	W. M. Biglane, Collins
18533	Mile Post Feed	Lampton & Rawls Co., Mt. Olive
18534	Mile Post Feed	The Lampton Co., Columbia
18547	Mile Post Feed	Hattiesburg Grocery Co., Hattiesburg
18539	Mile Post Feed	Columbia Grocery Co., Columbia
		Guarantee
18275	Nek-Yok Ox Feed	Hattiesburg Grocery Co., Hattiesburg
		Guarantee
	H. E. HALLIDAY MILLING CO. Cairo, Ill.	
17717	Wheat Bran	Lampton Mercantile Co., Magnolia
18267	Wheat Bran	Gulfport Grocery Co., Gulfport
18535	Wheat Bran	The Lampton Co., Columbia
		Guarantee
	HANNAH DISTRIBUTING CO., Jackson, Miss.	
18336	Corn Chops	Hannah Distributing Co., Jackson
		Guarantee
18217	Mixed Feed	Hannah Distributing Co., Jackson
		Guarantee
	HARRIS & COMPANY, Meridian, Miss.	
18565	Tip Top Cattle Feed	Harris & Co., Meridian
		Guarantee
	HUNTER ROBINSON WENZ MILLING CO., St. Louis, Mo.	
18205	Wheat Bran	R. H. Green & Bro., Jackson
18220	Wheat Bran	Taylor-Wills Grocery Co., Jackson
		Guarantee
18250	Wheat Midds	Merchants Grocery Co., Brookhaven
		Guarantee
18227	Sunshine Mixed Feed	C. J. Edwards Co., Vicksburg
		* Guarantee
	IGLEHEART BROS., Evansville, Ind.	
18283	Wheat Middlings	J. L. Wells, Meridian
18288	Wheat Middlings	Queen City Feed Store, Meridian
		Guarantee

* No guarantee submitted; sale illegal.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18270	11.07	4.36	3.94	11.56	60.73	8.34
18532	11.70	4.13	3.50	11.69	59.12	9.86
18533	10.42	4.04	3.81	11.13	60.04	10.56
18534	10.50	4.24	3.61	11.75	60.11	9.79
18547	8.18	5.09	3.93	12.44	61.30	9.06
18539	9.73	4.37	3.65	12.00	62.09	8.16
			3.50	*10.00*	*57.50*	*12.00*
18275	8.41	4.48	2.94	14.06	48.07	22.04
			3.50	*10.00*	*40.00*	*25.00*
17717	9.25	5.16	4.52	15.94	58.03	7.10
18267	7.72	4.73	4.39	15.94	61.14	6.08
18535	11.57	4.87	4.21	15.31	57.80	6.24
			4.00	*14.00*	*55.00*	*8.50*
18336	11.28	1.62	4.21	9.50	71.66	1.73
18217	9.09	4.71	5.98	18.00	58.64	3.58
			3.50	*10.00*	*55.00*	*12.00*
18565	7.93	3.62	3.03	10.81	45.67	28.94
			3.50	*12.50*	*29.24*	*33.81*
18205	9.52	5.39	4.66	16.69	56.49	7.25
18220	10.23	5.45	4.55	18.06	54.91	6.80
			3.50	*14.50*	*50.00*	*9.50*
18250	9.82	4.53	4.77	17.06	61.20	2.62
			4.00	*15.00*	*50.00*	*6.00*
18227	9.05	5.97	4.65	16.81	56.64	6.88
18283	9.74	4.31	5.24	17.81	58.09	4.81
18288	9.52	4.96	5.38	17.81	56.95	5.38
			4.00	*15.50*	*55.00*	*5.00*

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	ILLINOIS FEED MILLS, St. Louis, Mo.	
18193	Chicken Feed	McMahon Grocery Co., Greenville
17703	Chicken Feed	Rumble & Wensel Co., Natchez
		Guarantee
18317	Star Feed	Delta Grocery & Cotton Co., Clarksdale
18321	Star Feed	J. E. Wilson, Jr., Greenville
		Guarantee
*18211	Star Ox Feed	Capital Grocery Co., Jackson
*18811	Star Ox Feed	Capital Grocery Co., Jackson
18542	Star Ox Feed	Merchants Grocery Co., Hattiesburg
		Guarantee
	INTERNATIONAL SUGAR FEED NO. 2 CO., Memphis, Tenn.	
18552	International Horse & Mule Feed	Hawkins & Co., Hattiesburg
		Guarantee
	JACKSON FEED MILLS, Jackson, Miss.	
18338	Perfecto Horse Feed	Jackson Feed Mills, Jackson
		Guarantee
18339	Quality Cow and Ox Feed	Jackson Feed Mills, Jackson
		Guarantee
18337	Superior Horse & Mule Feed	Jackson Feed Mills, Jackson
		Guarantee
	KEMPER MILL AND ELEVATOR COMPANY, Kansas City, Mo.	
18551	Wheat Bran	W. E. Laird, Hattiesburg
18559	Wheat Bran	Tom Lyle Grocery Co., Meridian
		Guarantee
	KINGFALFA MILLS, Nebraska City, Neb.	
18202	Grain Mix Chick Feed	R. H. Green & Bro., Jackson
		Guarantee
17708	Kingfalfa Horse Feed	Merchants Gro. Co., Crystal Sp'gs
†18203	Kingfalfa Horse Feed	R. H. Green & Bro., Jackson
†18817	Kingfalfa Horse Feed	R. H. Green & Bro., Jackson
§18255	Kingfalfa Horse Feed	Merchants Gro. Co., Crystal Sp'gs
§18821	Kingfalfa Horse Feed	Merchants Gro. Co., Crystal Sp'gs

*Nos. 18211 and 18811 were drawn from the same shipment.
†Nos. 18203 and 18817 were drawn from the same shipment.
§Nos. 18255 and 18821 were drawn from the same shipment.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18193	9.76	11.79	2.97	9.13	64.09	2.26
17703	10.97	1.76	4.21	10.50	69.76	2.80
			3.50	*10.00*	*60.00*	*6.00*
18317	7.82	5.09	4.46	14.00	60.35	8.28
18321	9.20	5.00	4.18	12.81	59.41	9.40
			3.80	*12.00*	58.*00*	*8.90*
18211	11.74	4.09	3.91	12.50	62.21	5.55
18811	8.85	4.02	4.25	12.81	64.36	5.71
18542	10.08	4.41	4.35	13.69	60.81	6.66
			3.50	*14.00*	*60.00*	*11.00*
18552	9.38	8.31	4.99	14.38	51.10	11.84
			3.50	*12.50*	*50.00*	*12.00*
18338	8.53	6.37	4.12	14.81	60.60	5.57
			4.25	*14.25*	*52.00*	*10.00*
18339	8.90	3.92	4.92	15.88	58.66	7.72
			3.50	*10.00*	*45.00*	*20.00*
18337	8.89	3.85	4.16	10.63	64.35	8.12
			3.50	*10.00*	*52.00*	*12.00*
18551	9.61	6.87	4.85	15.69	53.48	9.50
18559	9.77	5.90	4.86	14.94	55.47	9.06
			4.00	*14.50*	*53.50*	*9.50*
18202	11.10	1.61	3.57	9.69	71.95	2.08
			3.50	*11.00*	*60.00*	*6.00*
17708	11.01	6.16	3.51	11.19	59.07	9.06
18203	10.79	5.21	2.77	10.88	61.61	8.74
18817	12.05	5.55	2.82	10.56	60.77	8.25
18255	9.41	5.32	3.24	11.25	62.44	8.34
18821	10.57	4.90	3.11	10.88	61.56	8.98

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
*18330	Kingfalfa Horse Feed	R. H. Green & Bro., Jackson
*18857	Kingfalfa Horse Feed	R. H. Green & Bro., Jackson
†18528	Kingfalfa Horse Feed	Merchants Gro. Co., Crystal Sp'gs.
†18859	Kingfalfa Horse Feed	Merchants Gro. Co., Crystal Sp'gs.
		Guarantee
§18851	P-Green Horse Feed	Walton Bros. & Co., Newton
18300	P-Green Horse Feed	Walton Bros. & Co., Newton
		Guarantee
	KOENINGSMARK MILLING COMPANY, Waterloo, Ill.	
18276	Wheat Bran	Hattiesburg Gro. Co., Hattiesburg
		Guarantee
18277	Wheat Middlings	Hattiesburg Gro. Co., Hattiesburg
		Guarantee
	KORNFALFA FEED MILLING CO., Kansas City, Mo.	
a18273	Kornfalfa	Union Naval Stores, Gulfport
a18822	Kornfalfa	Union Naval Stores, Gulfport
		Guarantee
	LEONA RICE MILLING CO., New Orleans, La.	
18301	Rice Polish	Yazoo Grocery Co., Yazoo City
		Guarantee
	LEXINGTON FLOUR MILLS, Lexington, Mo.	
18514	Wheat Bran	R. Viener & Co., Natchez
		Guarantee
18515	Wheat Shorts	R. Viener & Co., Natchez
18519	Wheat Shorts	I. Lowenberg & Co., Natchez
		Guarantee
	LIBERTY MILLS, Nashville, Tenn.	
18318	Wheat Shorts	Greenwood Grocery Co., Greenwood
		Guarantee
18537	Wheat Bran	G. B. Hall, Columbia
		Guarantee
	THE J. C. LYSLE MILLING COMPANY, Leavenworth, Kans.	
18558	Wheat Bran	J. L. Wells Grocery Co., Meridian
		Guarantee
18219	Wheat Shorts	Taylor-Wills Grocery Co., Jackson
		Guarantee

* Nos. 18330 and 18857 were drawn from the same shipment.
† Nos. 18528 and 18859 were drawn from the same shipment.
§ Shipped out of the state.
a Nos. 18273 and 18822 were drawn from the same shipment.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18330	7.85	5.38	3.25	11.50	62.05	9.97
18857	9.60	5.03	2.97	10.88	62.70	8.82
18528	11.96	5.72	2.60	12.06	60.22	7.44
18859	12.00	5.83	3.05	11.69	60.23	7.20
			3.50	*10.25*	*55.00*	*12.00*
18851	14.40	7.52	2.05	12.56	53.50	9.97
18300	8.79	4.85	3.50	11.31	63.58	7.97
			3.50	*10.25*	*55.00*	*12.00*
18276	8.77	6.93	5.00	15.50	55.21	8.59
			3.50	*14.00*	*54.00*	*10.00*
18277	10.71	5.18	5.38	17.75	56.85	4.13
			4.00	*16.00*	*56.00*	*7.00*
18273	10.88	3.79	3.21	11.06	62.27	8.79
18822	11.20	4.04	3.69	11.44	61.17	8.46
			3.50	*11.00*	*60.00*	*12.00*
18301	8.92	4.75	9.38	11.38	64.27	1.30
			4.77	*10.13*	*69.28*	*2.20*
18514	10.59	6.42	5.04	15.50	53.63	8.82
			3.57	*13.57*	*51.95*	*11.48*
18515	9.82	4.48	5.99	18.38	57.09	4.24
18519	10.19	4.27	5.93	18.13	57.16	4.32
			5.77	*16.55*	*58.01*	*4.33*
18318	8.05	6.41	5.88	18.94	55.66	5.06
			4.00	*16.00*	*48.00*	*6.00*
18537	10.29	5.71	4.02	16.25	56.59	7.14
			4.00	*14.50*	*50.00*	*9.50*
18558	9.82	6.89	4.92	15.25	53.75	9.37
			4.00	*15.00*	*52.00*	*10.00*
18219	9.11	4.48	5.66	18.38	57.05	5.32
			4.50	*14.50*	54.00	8.00

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	MARCO MILLS, Pine Bluff, Ark.	
18200	Corn Chops	D. W. Wilkinson & Bro., Jackson
		Guarantee
	GEO. B. MATTHEWS & SONS, New Orleans, La.	
17711	Rice Polish	Merchants Grocery Co., Hazlehurst
18527	Rice Polish	J. K. Dunn, McComb
		Guarantee
	MEEK MILLING CO., Marissa, Ill.	
18274	Wheat Bran and Wheat Screenings	Merchants Grocery Co., Hazlehurst
		Guarantee
	McCLELAND & SMITH, Jackson, Miss.	
18341	Whitfield's Mixed Feed	McCleland & Smith, Jackson
		Guarantee
	McDONALD HAY & GRAIN COMPANY, Memphis, Tenn.	
18316	McDonald's Special Alfalfa Mixed Feed	W. S. Campbell, Clarksdale
18342	McDonald's Special Alfalfa Mixed Feed	The Hub, Jackson
		Guarantee
	NATCHEZ-VIDALIA RICE MILLING CO., Natchez, Miss.	
17700	Rice Polish	R. Viener & Co., Natchez
		Guarantee
	NATIONAL FEED COMPANY, St. Louis, Mo.	
18520	Wheat Bran	Postlethwaite & Stewart Co., Natchez
18244	Wheat Bran	Postlethwaite & Stewart Co., Natchez
18226	Wheat Bran	Sol Fried Co., Vicksburg
		Guarantee
17716	Wheat Middlings	Lampton Mercantile Co., Magnolia
17727	Wheat Middlings	R. H. Green & Bro., Jackson
18206	Wheat Middlings	R. H. Green & Bro., Jackson
18232	Wheat Middlings	P. P. Williams Co., Vicksburg
18268	Wheat Middlings	Gulfport Grocery Co., Gulfport
		Guarantee

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18200	11.25	1.27	3.86	8.81	73.52	1.29
17711	9.23	5.01	11.44	12.31	60.87	1.14
18527	9.36	5.93	10.66	13.38	59.65	1.02
			5.00	*10.00*	*50.00*	*12.00*
18274	9.17	6.41	5.09	15.81	54.89	8.63
			3.50	*13.50*	*50.00*	*12.00*
18341	10.04	3.78	3.90	11.63	62.88	7.77
			3.50	*10.00*	*55.00*	*12.00*
18316	7.61	4.26	3.64	10.81	62.70	10.98
18342	9.58	5.10	3.44	10.50	69.51	1.87
			3.50	*10.00*	*58.00*	*12.00*
17700	9.33	7.12	11.75	11.88	57.74	2.18
			7.00	*11.00*	*65.00*	*2.50*
18520	9.33	5.66	5.23	16.81	55.44	7.53
18244	7.86	5.53	4.81	17.19	57.61	7.00
18226	9.83	6.69	5.00	16.00	53.47	9.01
			4.00	*14.00*	*54.00*	*9.50*
17716	9.64	4.40	4.50	16.44	59.79	5.23
17727	9.19	4.38	4.87	17.00	59.27	5.29
18206	10.31	4.65	5.33	17.38	56.79	5.54
18232	9.54	5.48	5.33	17.50	57.14	5.01
18268	10.49	4.26	5.11	17.44	57.89	4.81
			4.00	*16.00*	*56.00*	*7.00*

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	NATIONAL RICE MILLING COMPANY, New Orleans, La.	
18240	Rice Bran	I. Lowenberg & Co., Natchez
		Guarantee
	NEW BASIN WAREHOUSE & ELEVATOR CO., New Orleans, La.	
18282	Best-o-Feed	Buckley-Terry Co., Laurel
		* Guarantee
	NUTRILINE MILLING CO., Crowley, La.	
18256	Nutriline	Merchants Gro. Co., Crystal Sp'gs.
†18296	Nutriline	Winner-Klein Co., Meridian
†18855	Nutriline	Winner-Klein Co., Meridian
§18529	Nutriline	Merchants Gro. Co., Crystal Sp'gs.
§18860	Nutriline	Merchants Gro. Co., Crystal Sp'gs.
a18553	Nutriline	Winner-Klein Co., Meridian
a18861	Nutriline	Winner-Klein Co., Meridian
		Guarantee
	G. E. PATTESON & CO. Memphis, Tenn.	
18310	Sugaration Stock Feed	The Goyer Co., Greenville
		Guarantee
	GEO. P. PLANT MILLING CO. St. Louis, Mo.	
18233	Wheat Bran	R. L. Crook & Co., Vicksburg
17705	Wheat Bran	Postlethwaite & Stewart Co., Natchez
17702	Wheat Bran	Geisenberger & Friedler, Natchez
18259	Wheat Bran	W. A. McDonald, Bay St. Louis
18264	Wheat Bran	M. M. Moody, Long Beach
18266	Wheat Bran	Gulfport Grocery Co., Gulfport
18271	Wheat Bran	Hood Milling Co., Gulfport
18272	Wheat Bran	Union Naval Stores, Gulfport
18305	Wheat Bran	McMahon Grocery Co., Greenville
18512	Wheat Bran	A. Beer & Co., Natchez
18516	Wheat Bran	Geisenberger & Friedler, Natchez
		Guarantee
18306	Wheat Middlings	McMahon Grocery Co., Greenville
18265	Wheat Middlings	M. M. Moody, Long Beach
18260	Wheat Middlings	W. A. McDonald, Bay St. Louis
		Guarantee

* No guarantee submitted; sale illegal.
† Nos. 18296 and 18855 were drawn from the same shipment.
§ Nos. 18529 and 18860 were drawn from the same shipment.
a Nos. 18553 and 18861 were drawn from the same shipment.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18240	7.83	8.76	12.29	13.38	50.16	7.58
			10.25	*13.00*	*49.50*	*12.00*
18282	9.47	3.37	3.78	10.31	66.15	6.92
18256	9.63	8.50	6.44	11.31	56.47	7.65
18296	7.71	8.25	6.66	9.50	58.42	9.46
18855	9.48	8.78	6.66	9.00	54.58	11.50
18529	12.69	7.43	6.60	10.75	53.97	8.56
18860	12.09	8.37	6.95	10.25	52.59	9.75
18553	9.00	8.40	5.50	10.69	56.27	10.14
18861	10.37	8.13	5.38	10.31	56.74	9.07
			3.50	*12.00*	*58.00*	*10.00*
18310	9.14	5.04	4.50	14.19	58.01	9.12
			3.50	*11.65*	*64.00*	*11.04*
18233	8.61	6.20	4.76	16.50	55.47	8.46
17705	9.63	5.99	4.52	17.13	54.75	7.98
17702	9.68	6.32	4.50	16.88	54.04	8.58
18259	9.16	6.75	4.61	17.38	53.48	8.62
18264	8.64	6.10	4.59	17.31	54.80	8.56
18266	8.13	6.28	4.40	17.31	55.44	8.44
18271	10.27	6.95	4.66	16.88	52.51	8.73
18272	10.31	6.35	4.68	16.19	53.73	8.74
18305	7.73	6.63	5.02	16.31	55.89	8.42
18512	10.50	6.68	4.42	17.06	52.31	9.03
18516	9.78	6.71	4.45	17.31	52.89	8.86
			4.00	*16.00*	*54.00*	*9.00*
18306	8.43	7.17	5.14	18.44	56.53	4.29
18265	9.03	3.94	4.78	18.63	59.48	4.14
18260	9.25	4.79	5.51	18.31	57.17	4.97
			4.41	*17.11*	*59.18*	*5.18*

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	THE QUAKER OATS CO., Chicago, Ill.	
17692	Banner Feed	Mississippi Feed Co., Greenville
17699	Banner Feed	R. Viener & Co., Natchez
17701	Banner Feed	Geisenberger & Friedler, Natchez
17723	Banner Feed	Gaddis & McLaurin, Raymond
18218	Banner Feed	D. G. Patton & Co., Jackson
18229	Banner Feed	P. P. Williams Co., Vicksburg
*18234	Banner Feed	R. Viener & Co., Natchez
*18819	Banner Feed	R. Viener & Co., Natchez
18237	Banner Feed	Geisenberger & Friedler, Natchez
18298	Banner Feed	Meyer Bros., Meridian
18311	Banner Feed	Mississippi Feed Co., Greenville
18340	Banner Feed	D. G. Patton & Co., Jackson
18347	Banner Feed	J. W. Ratliff & Son, Edwards
18513	Banner Feed	R. Viener & Co., Natchez
18555	Banner Feed	Meyer Bros., Meridian
		Guarantee
17693	Cracker Mule Feed	Mississippi Feed Co., Greenville
18312	Cracker Mule Feed	Mississippi Feed Co., Greenville
		Guarantee
18235	Schumacher Chick Feed	R. Viener & Co., Natchez
		Guarantee
18236	Schumacher Scratching Grains	R. Viener & Co., Natchez
18238	Schumacher Scratching Grains	Geisenberger & Friedler, Natchez
		Guarantee
18314	Banner Scratching Grains	Mississippi Feed Co., Greenville
		Guarantee
17694	Schumacher's Stock Feed	Mississippi Feed Co., Greenville
18313	Schumacher's Stock Feed	Mississippi Feed Co., Greenville
		Guarantee
18204	Work More Feed	R. H. Green & Bro., Jackson
18329	Work More Feed	R. H. Green & Bro., Jackson
		† Guarantee
	RALSTON PURINA CO., St. Louis, Mo.	
17728	Chicken Feed	Capital Grocery Co., Jackson
18208	Chicken Feed	Capital Grocery Co., Jackson
18279	Chicken Feed	Hattiesburg Grocery Co., Hattiesburg
18307	Chicken Feed	The Goyer Co., Greenville
18562	Chicken Feed, Scratch Size	Tom Lyle Grocery Co., Meridian
		Guarantee
18269	Poultry Feed, Pigeon Size	Gulfport Grocery Co., Gulfport
18561	Poultry Feed, Pigeon Size	Tom Lyle Grocery Co., Meridian
		Guarantee

* Nos. 18234 and 18819 were drawn from the same shipment.
† No guarantee submitted; sale illegal.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17692	7.32	3.58	4.38	10.63	66.59	7.50
17699	8.73	3.35	4.06	10.06	65.98	7.82
17701	7.95	3.88	4.08	10.38	65.85	7.86
17723	9.28	3.27	3.76	10.31	65.98	7.40
18218	9.04	3.20	3.96	9.94	65.77	8.09
18229	8.65	3.38	3.64	10.81	66.22	7.30
18234	8.65	2.64	3.33	10.31	67.17	7.90
18819	10.67	3.60	3.47	10.13	64.03	8.10
18237	9.23	3.08	4.19	10.88	65.74	6.88
18298	8.01	3.55	4.16	10.56	66.99	6.73
18311	8.33	3.68	3.75	10.00	66.77	7.47
18340	8.81	3.59	3.64	10.56	65.32	8.08
18347	8.52	3.89	3.65	10.63	65.13	8.18
18513	10.01	3.50	3.89	10.44	63.94	8.22
18555	9.08	3.60	4.09	10.38	63.82	9.03
			3.75	*9.75*	*63.00*	*10.50*
17693	8.75	4.14	3.66	10.50	61.36	11.59
18312	7.45	4.08	3.77	10.63	62.97	11.10
			3.50	*10.00*	*58.00*	*12.00*
18235	9.14	1.82	4.15	11.06	72.11	1.72
			3.50	*10.00*	*60.00*	*5.00*
18236	9.02	1.63	3.90	11.75	71.47	2.23
18238	9.51	1.59	3.52	11.19	72.07	2.12
			3.50	*10.00*	*60.00*	*5.00*
18314	8.54	4.09	4.18	11.81	69.24	2.14
			3.50	*10.00*	*60.00*	*5.00*
17694	9.43	4.17	4.00	10.94	63.20	8.26
18313	7.64	5.74	4.91	10.75	61.36	9.60
			4.00	*10.00*	*62.00*	*10.00*
18204	9.47	4.17	3.50	10.63	61.88	10.35
18329	6.87	4.55	3.49	10.63	63.57	11.89
17728	10.82	1.83	3.06	11.69	70.26	2.34
18208	10.73	1.62	3.99	1 2.00	69.69	1.97
18279	9.45	1.88	3.68	11.75	70.86	2.38
18307	7.17	3.95	3.69	11.75	71.11	2.33
18562	11.92	1.81	4.02	12.06	67.68	2.51
			3.60	*11.00*	*65.00*	*4.00*
18269	11.53	1.89	2.85	12.94	67.97	2.82
18561	10.80	1.74	3.10	13.13	68.56	2.67
			3.60	*11.00*	*65.00*	*4.00*

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
17730	Protena Feed	Capital Grocery Co., Jackson
18210	Protena Feed	Capital Grocery Co., Jackson
18241	Protena Feed	Rumble & Wensel Co., Natchez
18332	Protena Feed	Capital Grocery Co., Jackson
		Guarantee
17731	Purina Feed	Capital Grocery Co., Jackson
18242	Purina Feed	Rumble & Wensel Co., Natchez
18287	Purina Feed	Tom Lyle Grocery Co., Meridian
18560	Purina Feed	Tom Lyle Grocery Co., Meridian
		Guarantee
*18280	Purina Molasses Feed	W. E. Laird, Hattiesburg
*18854	Purina Molasses Feed	W. E. Laird, Hattiesburg
		Guarantee
	RICKERT'S RICE MILL, New Orleans, La.	
18223	Rice Polish	Taylor-Wills Grocery Co., Jackson
		Guarantee
	ROBERTS & HAMNER GRAIN CO. Memphis, Tenn.	
18549	Corn Chops	Hattiesburg Grocery Co., Hattiesburg
		Guarantee
	ROBINSON & DANFORTH COMPANY, St. Louis, Mo.	
18278	Success Ox Feed	Hattiesburg Grocery Co., Hattiesburg
		Guarantee
	RUSSELL & BUTLER, Meridian, Miss.	
18557	Corn Chops	Meyer Bros., Meridian
		Guarantee
	N. SAUERS MILLING CO., Cherryvale, Kans.	
17695	Wheat Bran	Sol Fried, Vicksburg
17698	Wheat Bran	R. L. Crook & Co., Vicksburg
		Guarantee
17696	Wheat Shorts	Sol Fried, Vicksburg
		† Guarantee
	SCHULTZ-BAUJAN & CO., Beardstown, Ill.	
18841	Sunbeam Wheat Middlings	Threefoot Bros. & Co., Meridian
		† Guarantee

* Nos. 18280 and 18854 were drawn from the same shipment.
† No guarantee submitted sale illegal.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
17730	10.15	5.34	4.25	13.44	58.98	7.84
18210	9.46	4.06	4.44	14.13	59.71	8.20
18241	8.25	4.21	4.73	13.00	62.27	7.54
18332	8.02	4.33	4.29	13.94	59.83	9.59
			3.80	*12.00*	*58.00*	*8.90*
17731	10.23	3.88	4.88	13.25	60.77	6.99
18242	7.75	3.83	4.73	13.31	63.17	7.21
18287	8.57	3.83	4.47	14.38	60.91	7.84
18560	10.16	4.02	4.33	14.19	59.82	7.48
			4.00	*12.50*	*58.00*	*8.90*
18280	9.06	5.22	3.24	11.56	60.43	10.49
18854	10.23	6.94	3.17	12.94	58.55	8.17
			4.50	*11.50*	*59.00*	*10.00*
18223	10.65	5.95	10.07	11.88	60.11	1.34
			8.00	*11.00*	*60.00*	*2.00*
18549	10.95	1.23	3.96	9.25	72.90	1.71
18278	9.88	4.39	4.55	13.38	61.80	6.00
			3.50	*14.00*	*60.00*	*11.00*
18557	11.49	1.28	3.99	8.69	73.18	1.37
17695	9.76	6.03	4.37	16.13	55.71	8.00
17698	8.99	6.26	4.55	16.63	55.05	8.52
			3.95	*15.00*	*53.10*	*11.65*
17696	10.05	4.72	5.40	17.50	56.53	5.80
18841	11.33	4.50	5.06	17.31	56.91	4.89

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	SOUTHERN RICE MILLING COMPANY, New Orleans, La.	
18517	Rice Polish	I. Lowenberg & Co., Natchez
		* Guarantee
	SOUTHWESTERN MILLING COMPANY, Kansas City, Mo.	
18556	Wheat Bran	Meyer Bros., Meridian
		Guarantee
	STAFOLIFE FEED & MILLING COMPANY, New Orleans, La.	
		Merchants Gro. Co., Crystal Sp'gs.
17707	Stafolife	J. S. Allred & Son, Hazlehurst
17709	Stafolife	L. H. Matthews, Hazlehurst
17712	Stafolife	Lampton Bros. Co., Tylertown
17714	Stafolife	Chas. Edler Gro. Co., Brookhaven
17720	Stafolife	Capital Grocery Co., Jackson
17729	Stafolife	Capital Grocery Co., Jackson
18209	Stafolife	Chas. Edler Gro. Co., Brookhaven
18252	Stafolife	L. H. Matthews, Hazlehurst
18257	Stafolife	W. A. McDonald, Bay St. Louis
18262	Stafolife	M. M. Moody, Long Beach
18263	Stafolife	Foote-Patrick Co., Laurel
18281	Stafolife	Queen City Feed Co., Meridian
18289	Stafolife	Gaddis & McLaurin, Bolton
18344	Stafolife	A. Beer & Co., Natchez
18511	Stafolife	Guarantee
	TUTT-MILLSPAUGH GRAIN COMPANY, Meridian, Miss.	
		Columbia Grocery Co., Columbia
18538	Oxlife Cow and Ox Feed	Guarantee
	VALLEY MILLING CO., St. Louis, Mo.	
18228	Delta Feed	C. J. Edwards Co., Vicksburg
		Guarantee
	J. W. VANCE, Pierce City, Mo.	
18285	Shorts	Tom Lyle Grocery Co., Meridian
		Guarantee

* No guarantee submitted; sale illegal.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Crude Fiber—Per Cent.	Carbohydrates—Per Cent.
18517	8.71	5.58	9.25	12.25	61.85	2.36
18556	9.21	6.78	4.40	15.19	55.06	9.36
			4.00	*15.25*	*54.35*	*9.50*
17707	10.04	10.07	7.43	12.25	49.36	10.85
17709	7.95	10.12	6.99	14.19	50.15	10.60
17712	10.23	10.00	7.15	13.25	49.88	9.49
17714	9.56	9.86	6.38	12.00	51.26	10.94
17720	9.87	10.06	6.41	12.69	50.50	10.47
17729	9.97	10.11	7.01	12.63	51.18	9.10
18209	9.91	9.29	6.44	12.31	53.68	8.37
18252	9.20	10.47	6.82	13.56	49.50	10.45
18257	9.19	9.60	6.17	13.31	50.38	11.35
18262	9.07	10.00	5.51	11.56	51.65	12.21
18263	8.09	8.51	5.85	12.69	55.52	9.34
18281	9.73	8.81	6.34	12.31	53.55	9.26
18289	7.77	9.87	5.61	13.50	52.60	10.65
18344	7.90	10.96	5.86	11.75	53.01	10.52
18511	10.43	8.38	5.63	12.00	52.93	10.63
			5.00	*11.00*	*53.00*	*12.00*
18538	7.81	2.87	2.97	11.50	48.21	26.64
			3.50	*12.50*	*32.20*	*30.84*
18228	8.23	3.05	4.53	10.19	67.35	6.65
			4.25	*9.25*	*50.00*	*12.00*
18285	9.50	5.07	5.74	17.19	56.68	5.82
			4.00	*12.00*	*55.00*	*12.00*

TABLE 1.—ANALYSES OF COMMERCIAL FEEDING STUFFS

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	WEBB & MAUREY Memphis, Tenn.	
18290	Corn Chops	A. J. Lyons & Co., Meridian
		Guarantee
18297	Dixie Hen Feed	Winner-Klein & Co., Meridian
		§ Guarantee
18554	Omega Stock Feed	Winner-Klein & Co., Meridian
		§ Guarantee
18292	Riverside Dairy Feed	Winner-Klein & Co., Meridian
		Guarantee
18295	Sampson Stock Feed	Winner-Klein & Co., Meridian
		Guarantee
	WELLS-ABBOTT NUMAN COMPANY, Schuyler, Neb.	
18225	Wheat Shorts	Sol Fried Co., Vicksburg
		§ Guarantee
	YATES & DONELSON CO., Memphis, Tenn.	
*17726	Wheat Bran	R. H. Green & Bro., Jackson
*18802	Wheat Bran	R. H. Green & Bro., Jackson
†17719	Wheat Bran	Chas. Edler Gro. Co., Brookhaven
†18801	Wheat Bran	Chas. Edler Gro. Co., Brookhaven
		Guarantee
18304	Wheat Bran Mixed with Corn Bran	Yazoo Grocery Co., Yazoo City
		Guarantee
17718	Gray Shorts	Chas. Edler Gro. Co., Brookhaven
		§ Guarantee
	G. ZIEBOLD MILLING O., Red Bud, Ill.	
18567	Wheat Bran	Tutt-Millspaugh Grain Co., Meridian
18291	Wheat Bran	A. J. Lyons & Co., Meridian
18286	Wheat Bran	Tom Lyle Grocery Co., Meridian
18197	Wheat Bran	D. W. Wilkinson & Bro., Jackson
		Guarantee

* Nos. 17726 and 18802 were drawn from the same shipment.
† Nos. 17719 and 18801 were drawn from the same shipment.
§ No guarantee submitted; sale illegal.

COLLECTED BY STATE CHEMIST, SEASON 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18290	9.82	1.22	4.02	9.13	74.44	1.37
18297	8.92	1.94	4.17	10.81	71.36	2.80
18554	8.90	6.71	7.29	13.88	53.49	9.73
18292	7.56	8.47	6.68	19.00	45.19	13.10
			4.00	*18.00*	*45.00*	*14.00*
18295	7.39	5.06	6.38	17.50	56.05	7.62
			3.50	*14.00*	*40.00*	*12.00*
18225	9.60	3.95	5.76	17.69	58.86	4.14
17726	9.02	4.35	5.38	12.44	61.14	7.67
18802	8.89	4.98	4.58	12.94	60.47	8.14
17719	9.90	4.66	4.51	12.56	60.21	8.16
18801	8.30	5.52	4.49	12.94	60.49	8.26
			3.58	*14.85*	*54.60*	*10.00*
18304	8.21	6.48	5.31	14.50	57.89	7.61
			3.70	*13.25*	*57.15*	*10.00*
17718	9.13	4.36	5.37	16.31	59.73	5.10
18567	8.68	6.02	4.39	16.19	57.14	7.58
18291	7.60	5.60	4.87	16.13	58.85	6.95
18286	9.78	6.44	4.65	15.19	56.05	7.89
18197	11.01	5.66	4.63	15.94	55.62	7.14
			3.50	*14.50*	*55.00*	*9.00*

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi.

BULLETIN No. 154.

INSPECTION AND ANALYSES OF COMMERCIAL FEEDING STUFFS

ON SALE IN THE STATE.

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISSISSIPPI.

DECEMBER, 1911.

TUCKER PRINTING HOUSE JACKSON MISS

MISSISSIPPI FERTILIZER AND FEEDING STUFFS CONTROL.

INSPECTION AND ANALYSES OF FEEDING STUFFS.

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a Resigned November 1, 1911.
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INSPECTION AND ANALYSES OF COMMERCIAL FEEDING STUFFS.*

Season 1910-1911.

December, 1911.

Introduction.—This bulletin completes the report of the inspection of commercial feeding stuffs for the season of 1910-1911. Table II contains analyses of 606 samples. These samples were drawn from shipments in the possession of dealers in almost all parts of the state. During the entire season, 1134 samples were analyzed, and 78 of these represented shipments made without authority of law, since no guarantee was filed as required by section 3 of the Feeding Stuffs Act.

Since the feeding stuffs law became effective in July, 1908, a large number of analyses have been made and published in these bulletins which are widely distributed. Four bulletins are issued each season, and the analyses carried by them show the actual composition of all kinds of feed offered to the feeder in this state. The results of these analyses ought to receive the careful attention of those who must buy feeds, because they illustrate in a forcible way the fact that there are great variations, not only in well known by-products used for feeding but also in ready mixed feeds. Every purchaser, therefore, should examine the tabulated analyses with the view of ascertaining the actual composition of feeds and feed mixtures which may be bought. This information is required in intelligent feeding, and it is scarcely less necessary in aiding the buyer to select feeds supplying nutrients at the lowest cost. In this way also he may avoid the products of those sellers and manufacturers who are not as careful as they should be to see that the feeds supplied by them equal or exceed the guaranty which the law requires for the protection of the buyer.

Price and quality.—In past years the price of a ton of feed has been a consideration too often uppermost doubtless in the minds of buyers. The chemical composition of unmixed feed and by-products and the chemical and physical composition of feed mixtures must

* The publication of this bulletin was delayed on account of the destruction by fire of the plant of the Tucker Printing House.

be known before the feeder may determine whether the price asked is properly related to the quality of the feed. The publication in these bulletins of large numbers of analyses of all kinds of feed on the market and of elementary discussions of their purchase and use will be of some assistance, it is hoped, in stimulating a spirit of inquiry on the part of purchasers, that they may buy to better advantage the nutrients, fat, protein, and carbohydrates, and also that they may feed their animals more rationally and in accordance with the best practices.

Suggestions concerning the purchase of feeds have been published in previous bulletins.

The purchaser ought to know:

1. The kind of feed which he should buy. A discussion of functions of feed nutrients, composition of feeding stuffs, digestibility, feeding standards, computation of rations, etc., etc., will be found in Bulletin No. 144, which was distributed last December. Each feeder must decide for himself the character of feeding stuffs he must buy for use in connection with home grown feeds that his animals may be given palatable and properly proportioned rations at the lowest possible cost.

2. The guaranteed analysis of the feeds which are offered. A tag showing the seller's guarantee is attached to each bag of feed sold in this state. This tag shows also the number of pounds of feed in the bag and the name and address of the guarantor. Feeds must be true to name. Wheat bran, shorts, rice polish and bran, etc., etc., must be sold unmixed with any foreign product whatever. Mixtures of products must be marketed as mixed feeds.

3. The products out of which mixed feeds are made. This information should be given on the guarantor's tag. The law now in force does not require it. The purchaser is able to form a better judgment of the digestibility and palatability of a feed mixture if he knows the materials which compose it. Viable weed seeds may add to the stock of weeds already about the premises and on the farm.

4. Whether analyses in these bulletins show that the sellers supply feed well above their guaranties. In buying any feed, it is important to consult these analyses. The tables will show that some manufacturers are conservative in making guaranties, and it remains for the analyses of samples of shipments to show that the feed supplied is usually much better than the guaranteed analysis indicates. On the other hand certain brands of feed often barely meet the guarantee

and frequently fall below it. These analyses will show the buyer what he may expect in actual delivery.

5. That the price asked bears a proper relation to the fat, protein, and carbohydrates contained in the feed. The buyer desires to obtain, of course, the best possible feed for the money. Mixed feed sespecially vary greatly in composition, and there should be also a variation in the price asked for them. Feeds rich in fat and protein associated with small percentages of fiber cannot be had for a low price per ton. The quality of the feed as indicated by guaranties and analyses must be known before the buyer may determine whether the price per ton asked is a reasonable one. He may be able to buy a ton of a better feed for the same amount of money.

General results of the inspection.—For the convenience of purchasers and for reference the general results of the analytical work for the season are reviewed and briefly summarized in Table I. In this connection the following short tabular statement is not without interest:

Number of samples without guarantee..... 78
Number of samples of brands properly guaranteed.....1056
Total number samples analyzed.....1134

	Number Samples.	Percentage of Analyses representing brands properly guaranteed.
Samples above guarantee in all constituents.....	686	64.96
Samples below guarantee in any constituent	370	35.04
Samples **above** guarantee in fat to extent of 10% of amount guaranteed.....	525	49.71
Samples **below** guarantee in fat to extent of 10% of amount guaranteed.....	167	15.81
Samples **above** guarantee in protein to extent of 10% of amount guaranteed.....	401	37.97
Samples **below** guarantee in protein to extent of 10% of amount guaranteed.....	36	3.40
Samples below guarantee in both fat and protein to extent of 10% of amount guaranteed.....	14	1.32
Samples above guarantee in fiber.....	51	4.83

Reference to bulletins issued during the season and to the summary in table I will show the necessity of invoking the penalties of the law with the view of correcting the careless preparation of feeds sold.

Deficiencies in fat are most common. This is doubtless due in large measure to the provision of the old law requiring that all feeds be guaranteed to contain not less than 3.50% of fat. In some classes of feeds, especially perhaps in the chicken and molasses feeds, this minimum standard for fat was somewhat difficult to reach.

Enforcement of the law.—Feeds noted as sold without guarantee usually consisted of small lots shipped by brokers or by manufacturers ignorant of the requirements of the law. In all cases of this kind the dealers were warned and notified of their responsibility under the feeding stuffs Act. Affidavits were filed against dealers in various parts of the state for handling feeds found below guarantee. In most of these cases the county prosecuting attorneys willingly co-operated with inspectors. Attention to these prosecutions consumed a great deal of the time of the chief inspector and were often unsuccessful on account of defects in the law. These defects, however, have been corrected by the new law which became effective on March 17th of this year and little difficulty is anticipated in the enforcement of the new Act.

TABLE I.—A General Summary and Analysis of the Results of the Inspection, Season 1910-1911.

Name and Address of Gaurantor.	Number of Samples without Guarantees.	Number of Samples Analyzed.	Number above Guarantee in all Constituents.	Number below Guarantee in any Constituent.	Number ten per cenr below Guarantee in Fat.	Number ten per cent. below Guarantee in Protein.	Number ten per cent below Guarantee in both Fat and Protein.	Number ten per cent above Guarantee in Fiber.	Number ten per cent above Guarantee in Fat.	Number ten per cent above Guarantee in Protein.	Percentage of all Samples above Guarantee in all Constituents.	Percentage of all Samples below Guarantee in any Constituent.
Abbeville Rice Milling Co., Abbeville, La.		1	0	1	1	0	0	0	0	1		
Akin-Erskine Milling Co., Evansville, Ind.		10	6	4	0	0	0	8	4	1	60.00	40.00
Alabama Corn Mills Co., Mobile, Ala.		2	1	1	0	0	0	0	2	1	50.00	50.00
Alfalfa Products Co., Jackson, Miss.	2	9	1	6	2	3	1	0	0	2	14.29	85.71
Allen Baker Commission Co., St. Louis, Mo.		5	5	0	0	0	0	0	5	0	100.00	0.00
American Milling Company, Chicago, Ill.		11	4	7	5	0	0	0	3	3	36.37	63.63
Arkadelphia Milling Co., Arkadelphia, Ark.		9	9	0	0	0	0	0	9	9	100.00	0.00
Arlington Roller Mills, Arlington, Ky.		1	1	0	0	0	0	0	1	0		
Aurora Milling Co., Aurora, Mo.		8	7	1	0	0	0	0	8	3	87.50	12.50
Aunt Patsy Poultry Feed Co., Memphis, Tenn.	6	6										
Ballard & Ballard Co., Louisville, Ky.		6	5	1	0	0	0	0	5	1	83.34	16.66
C. Becker Milling Co., Red Bud, Ill.		11	11	0	0	0	0	5	11	6	100.00	0.00
Biloxi Milling Co., Biloxi, Miss.		1	0	1	1	0	0	0	0	1		
Blair Milling Co., Atchinson, Kan.		1	0	1	1	1	1	0	0	0		
Brookhaven Cotton Oil & Fert. Co., B'haven, Miss.		2	2	0	0	0	0	0	2	2	100.00	0.00
Browder Milling Co., Fulton, Ky.		5	1	4	0	0	0	0	2	0	20.00	80.00
W. P. Brown & Company, Memphis, Tenn.	1	1										
Cairo Milling Company, Cairo, Ill.	3	16	12	1	0	0	0	0	7	6	92.31	7.69
Cape County Milling Co., Jackson, Mo.		5	3	2	0	0	0	0	5	3	60.00	40.00
W. F. Chamberlain Feed Co., St. Louis, Mo.	1	2	0	1	0	0	0	0	0	0	0.00	100.00
Chapin & Company, St. Louis, Mo.		1	0	1	1	0	0	1	0	1		
Charleston Milling Co., Charleston, Mo.		2	0	2	1	0	0	0	0	0	0.00	100.00

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Cleveland Brothers, Mobile, Ala.		2	2	0	0	0	0	0	2	2	100.00	0.00
Columbia Star Milling Co., Columbia, Ill.		7	2	5	3	0	0	3	1	0	28.57	71.43
Concordia Mill & Elevator Co., Concordia, Mo.		1	1	0	0	0	0	0	1	0		
L. P. Cook, Memphis, Tenn.	1	4	2	1	0	0	0	0	1	1	66.67	33.33
Corno Mills Company, St. Louis, Mo.		95	61	34	12	9	0	2	33	31	64.21	35.79
Cyphers Incubator Co., Buffalo, N. Y.	3	3										
Dahnke-Walker Milling Co., Union City, Tenn.		8	5	3	0	2	0	0	5	1	62.50	37.50
C. A. Dammann & Co., Memphis, Tenn.	2	3	0	1	0	1	0	0	0	0	0.00	100.00
Davis & Andrews Co., Memphis, Tenn.	1	7	6	0	0	0	0	0	6	6	100.00	0.00
Dean Mill Co., Ava, Ill.		1	1	0	0	0	0	0	1	0		
Dixie Grain Co., Mobile, Ala.	1	1										
Domestic Flour Milling Co., Kansas City, Mo.	4	36	32	0	0	0	0	0	30	25	100.00	0.00
Dunlap Milling Co., Clarksville, Tenn.		2	2	0	0	0	0	0	2	1	100.00	0.00
Edgar-Morgan Co., Memphis, Tenn.		34	19	15	6	1	1	0	7	11	55.88	44.12
Eggers Milling Co., Hermann, Mo.	2	5	2	1	0	0	0	0	0	1	66.67	33.33
Eisenmayer Milling Co., Springfield, Mo.	1	5	1	3	3	0	0	0	1	0	25.00	75.00
Empire Rice Mill Co., New Orleans, La.		3	3	0	0	0	0	0	3	2	100.00	0.00
Freeburg Milling Co., Freeburg, Ill.		2	2	0	0	0	0	0	1	2	100.00	0.00
A. H. George Co., Meridian, Miss.		10	6	4	3	3	2	1	7	6	60.00	40.00
J. T. Gibbons, New Orleans, La.	1	3	2	0	0	0	0	0	2	1	100.00	0.00
B. F. Glover & Son Com. Co., New Orleans, La.		8	8	0	0	0	0	2	5	4	100.00	0.00
Grain Products Co.,		3	0	3	2	1	1	0	0	0	0.00	100.00

Great Western Cereal Co., Chicago, Ill.	1	74	32	41	20	1	0	0	9	23	43.84	56.16
Great Western Feed Co., St. Louis, Mo.		10	0	10	10	0	0	5	0	1	0.00	100.00
Gulfport Grocery Co., Gulfport, Miss.		26	17	9	5	0	0	0	6	26	65.38	34.62
H. L. Holliday Milling Co., Cairo, Ill.		6	4	2	2	2	2	0	2	2	66.67	33.33
Hannah Distributing Co., Jackson, Miss.	1	20	19	0	0	0	0	0	19	19	100.00	0.00
Harris & Company, Meridian, Miss.		5	0	5	4	3	3	0	1	0	0.00	100.00
Hattiesburg Grocery Co., Hattiesburg, Miss.		2	0	2	0	0	0	0	2	0	0.00	100.00
Hezel Milling Co., East St. Louis, Mo.		1	1	0	0	0	0	0	1	1		
Hunter-Robinson Wenz Milling Co., St. Louis, Mo.	2	13	10	1	0	0	0	0	10	7	90.91	9.09
Igleheart Brothers, Evansville, Ind.		3	3	0	0	0	0	0	3	2	100.00	0.00
Illinois Feed Mills, St. Louis, Mo.		26	17	9	2	2	1	4	18	9	65.38	34.62
International Sugar Feed No. 2 Co., Memphis, Tenn.		9	6	3	1	1	0	0	5	2	66.67	33.33
Jackson Feed Mills, Jackson, Miss.		3	2	1	0	0	0	0	2	1	66.67	33.33
Kelly Milling Co., Kansas City, Mo.		2	2	0	0	0	0	1	2	0	100.00	0.00
Kemper Mill & Elevator Co., Kansas City, Mo.		14	9	5	1	0	0	1	6	7	64.29	35.71
Kingfalfa Mills, Nebraska City, Neb.		18	2	16	11	1	0	0	0	7	11.11	88.89
Koeningsmark Milling Co., Waterloo, Ill.		2	2	0	0	0	0	0	2	2	100.00	0.00
Kornfalfa Feed Milling Co., Kansas City, Mo.		6	3	3	0	0	0	0	2	0	50.00	50.00
Langenberg Hay & Grain Co., New Orleans, La.		2	1	1	0	0	0	0	2	0	50.00	50.00
Lawrence Bros. Co., Crowley, La.		2	1	1	1	0	0	1	0	0	50.00	50.00
Lawrence & Hamilton Feed Co., New Orleans, La.		11	0	11	5	0	0	0	0	1	0.00	100.00
Leona Rice Milling Co., New Orleans, La.		1	1	0	0	0	0	0	1	1		
Lexington Flouring Mills, Lexington, Mo.		5	5	0	0	0	0	0	2	3	100.00	0.00
Lexington Mill & Elevator Co., Lexington, Mo.	1	1										
Liberty Mills, Nashville, Tenn.		21	19	2	1	0	0	0	15	4	90.48	9.52
Lukens Milling Co., Atchinson, Kan.		3	3	0	0	0	0	0	2	3	100.00	0.00
J. C. Lysle Milling Co., Leavenworth, Kan.		6	6	0	0	0	0	0	6	5	100.00	0.00
Maney Milling Co., Omaha, Neb.	1	1										
Marco Mills, Pine Bluff, Ark.	2	2										
Geo. B. Matthews & Sons, New Orleans, La.		5	5	0	0	0	0	0	5	4	100.00	0.00
Meek Milling Co., Marissa, Ill.		12	12	0	0	0	0	0	11	11	100.00	0.00
Millstadt Milling Co., Millstadt, Ill.		6	2	4	2	0	0	1	2	2	33.34	66.66
Mohlenbrock Milling Co., Campbell Hill, Ill.		1	1	0	0	0	0	0	1	1		
McCleland & Smith, Jackson, Miss.		1	1	0	0	0	0	0	1	1		
McCord, Crockett & Kolp, Memphis, Tenn.		2	2	0	0	0	0	0	2	2	100.00	0.00
McDonald Hay & Grain Co., Memphis, Tenn.		10	4	6	1	0	0	0	1	3	40.00	60.00
McInnis & Sturgis, Meridian, Miss.	2	6	4	0	0	0	0	4	4	3	100.00	0.00
McMillan & Harrison, Mobile, Ala.	1	1										

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Natchez-Vidalia Rice Milling Co., Natchez		6	5	1	0	0	0	0	6	3	83.34	16.66
National Feed Co., St. Louis, Mo.		22	19	3	0	0	0	0	18	7	86.36	13.64
National Rice Milling Co., New Orleans, La.		17	1	16	13	1	1	1	1	2	5.88	94.12
New Athens Milling Co., New Athens, Ill.	1	6	5	0	0	0	0	1	3	3	100.00	0.00
New Basin Warehouse & Elevator Co., New Orleans	7	7										
Nutriline Milling Co., Crowley, La.		13	2	11	0	8	0	1	13	1	15.39	84.61
G. E. Patteson & Co., Memphis, Tenn.		4	4	0	0	0	0	0	3	2	100.00	0.00
Phoenix Flour Mills, Evansville, Ind.		1	1	0	0	0	0	0	1	0		
Geo. P. Plant Milling Co., St. Louis, Mo.		50	45	5	0	0	0	1	34	5	90.00	10.00
Quaker Oats Co., Chicago, Ill.	4	73	37	32	14	0	0	2	11	13	53.62	46.38
Ralston Purina Co., St. Louis, Mo.	2	60	29	29	19	0	0	3	17	13	50.00	50.00
Randolph Milling Co., Baldwin, Ill.		1	1	0	0	0	0	0	1	0		
Rayne Rice Milling Co., Rayne, La.		1	0	1	1	0	0	0	0	0		
Reichert Milling Co., Freeburg, Ill.		1	1	0	0	0	0	0	0	0		
Reckert's Rice Mills, New Orleans, La.		2	2	0	0	0	0	0	1	0	100.00	0.00
W. M. Rings, Clinton, Ky.		1	1	0	0	0	0	0	1	1		
Roberts & Hamner Grain Co., Memphis, Tenn.	1	4	2	1	0	0	0	2	3	0	66.67	33.33
Robinson Danforth Co., St. Louis, Mo.		3	1	2	0	0	0	0	2	0	33.34	66.66
Russell & Butler, Meridian, Miss.	1	1										
Rutherford Milling Co., Rutherford, Tenn.		1	0	1	0	0	0	0	0	0		
St. Mary's Mill Co., St. Mary's, Mo.		2	2	0	0	0	0	1	2	0	100.00	0.00
Sauers Milling Co., Evansville, Ind.		3	3	0	0	0	0	0	1	0	100.00	0.00

N. Sauers Milling Co., Cherryvale, Kan.	1	5	4	0	0	0	0	0	4	3	100.00	0.00
Saxony Mills, St. Louis, Mo.	1	1										
Schultz-Banjan & Co., Beardstown, Ill.	1	1										
Scott County Milling Co., Sikestown, Mo.	1	3	0	2	1	0	0	0	1	0	0.00	100.00
Siewerd Milling Company, New Orleans, La.		1	0	1	0	0	0	0	1	0		
Southern Rice Milling Co., New Orleans, La.	6	6										
Southwestern Milling Co., Kansas City, Mo.		1	0	1	0	0	0	0	1	0		
Stafolife Feed & Milling Co., New Orleans, La.	1	32	27	4	0	0	0	0	22	14	87.10	12.90
Stanard-Tilton Milling Co., St. Louis, Mo.		6	4	2	1	0	0	0	3	5	66.67	33.33
Star Rice Milling Co., New Orleans, La.		1	1	0	0	0	0	0	1	0		
Steinhardt & Co., New Orleans, La.	1	1										
Taylor-Wills Grocery Co., Jackson, Miss.	1	1										
Tennessee Fibre Co., Memphis, Tenn.		7	7	0	0	0	0	0	3	5	100.00	0.00
Threefoot Brothers & Co., Meridian, Miss.		1	1	0	0	0	0	0	1	1		
Trenholm-Kolp Co., Memphis, Tenn.		4	4	0	0	0	0	0	4	4	100.00	0.00
Tutt-Millspaugh Grain Co., Meridian, Miss.		2	1	1	1	0	0	0	1	1	50.00	50.00
Union City Grain & Feed Co., Union City, Tenn.		4	0	4	1	1	1	0	1	0	0.00	100.00
United States Rice Milling Co., Crowley, La.		2	0	2	1	0	0	0	0	1	0.00	100.00
Valier & Spies Milling Co., St. Louis, Mo.		4	4	0	0	0	0	0	4	2	100.00	0.00
Valley Milling Co., St. Louis, Mo.		5	4	1	0	0	0	0	3	2	80.00	20.00
J. W. Vance, Pierce City, Mo.		4	4	0	0	0	0	0	3	3	100.00	0.00
John Wade & Sons, Memphis, Tenn.	2	25	15	8	7	0	0	0	10	9	65.22	34.78
Washburn-Crosby Co., Minneapolis, Minn.		3	3	0	0	0	0	0	3	3	100.00	0.00
Waterloo Milling Co., Waterloo, Ill.		5	5	0	0	0	0	0	4	3	100.00	0.00
Webb & Maury, Memphis, Tenn.	4	11	7	0	0	0	0	0	5	4	100.00	0.00
Wells-Abbott Numan Co., Schuyler, Neb.	1	1										
Yates & Donelson Co., Memphis, Tenn.	2	14	7	5	0	4	0	0	10	0	58.33	41.67
G. Ziebald Milling Co., Red Bud, Ill.		6	6	0	0	0	0	0	5	4	100.00	0.00
J. Zimmern's Company, Mobile, Ala.		1	0	1	1	0	0	0	0	0		
Totals	78	1134	686	370	167	36	14	51	525	401		
Percentage of guaranteed (1056) samples			64.96	35.04	15.81	3.40	1.32	4.83	49.71	37.97		

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	AKIN-ERSKINE MILLING CO., Evansville, Ind.	
18703	Wheat Shorts	Broadway Merc. Co., Lucedale
		Guarantee
	AMERICAN MILLING CO., Chicago, Ill.	
18898	Sucrene Dairy Feed	C. J. Edwards Co., Vicksburg
		Guarantee
*18899	Sucrene H. & M. Feed	C. J. Edwards Co., Vicksburg
*19280	Sucrene H. & M. Feed	C. J. Edwards Co., Vicksburg
†18903	Sucrene H. & M. Feed	Sol Fried & Co., Vicksburg
†19281	Sucrene H. & M. Feed	Sol Fried & Co., Vicksburg
18958	Sucrene H. & M. Feed	Clark Grocery Co., Tupelo
		Guarantee
	ARLINGTON ROLLER MILLS, Arlington, Ky.	
18614	Bran	G. T. Eggleston, Greenwood
		Guarantee
	AUNT PATSY POULTRY FEED COMPANY, Memphis, Tenn.	
18944	Aunt Patsy's Poultry Feed	Morrison, Rinehart Gro. Co., Corinth
		‡Guarantee
	AURORA MILLING COMPANY, Aurora, Mo.	
18920	Aurora Mixed Feed	W. H. Pritchartt & Co., Natchez
		Guarantee
18921	Cream Wheat Shorts	W. H. Pritchartt & Co., Natchez
		Guarantee
	BALLARD & BALLARD CO., Louisville, Ky.	
18584	Ballard's Shipstuff	Bolivar Merc. Co., Shaw
		Guarantee
	C. BECKER MILLING CO., Red Bud, Ill.	
18548	Wheat Bran	Hattiesburg Gro. Co., Hattiesburg
18992	Wheat Bran	Wiley S. Keys, West Point
		Guarantee

* Nos. 18899 and 19280 were drawn from the same shipment.
† Nos. 18903 and 19281 were drawn from the same shipment.
‡ No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18703	11.21	3.88	4.87	16.50	59.06	4.48
			4.50	*16.36*	*62.66*	*3.90*
18898	10.76	9.68	4.75	19.19	45.76	9.86
			3.50	*16.50*	*46.00*	*12.00*
18899	12.10	5.47	2.71	10.31	61.04	8.37
19280	10.20	4.98	2.95	9.94	64.57	7.36
18903	11.76	5.61	2.89	9.81	60.78	9.15
19281	10.00	4.74	2.76	10.13	63.37	9.00
18958	8.50	5.86	3.93	12.56	58.00	11.15
			3.50	*10.00*	*50.00*	*12.00*
18614	9.09	6.55	5.14	14.63	56.09	8.50
			4.00	*14.00*	*52.00*	*9.00*
18944	8.09	10.96	4.07	15.25	53.96	7.67
18920	9.21	4.60	5.44	17.31	55.89	7.55
			3.50	*16.00*	*53.00*	*10.00*
18921	10.11	3.32	6.27	18.56	57.66	4.08
			4.00	*15.00*	*60.00*	*8.00*
18584	10.94	4.44	4.88	17.00	57.11	5.63
			3.75	*15.69*	*55.00*	*6.87*
18548	8.51	6.00	4.49	16.06	56.76	8.18
18992	8.51	5.78	4.00	15.44	57.60	8.67
			3.58	*14.50*	*52.00*	*10.00*

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
18540	Wheat Shorts	Columbia Grocery Co., Columbia
18550	Wheat Shorts	Hattiesburg Gro. Co., Hattiesburg
18888	Wheat Shorts	Mars Bros., Philadelphia
18887	Wheat Shorts	Henderson-Molphus Co., Phila'phia
		Guarantee
	BLAIR MILLING COMPANY, Atchison, Kansas.	
18576	Blair's Corn Chops	P. P. Williams Co., Vicksburg
		Guarantee
	CAIRO MILLING COMPANY, Cairo, Ill.	
18655	Premium XXXX Horse and Mule Feed	C. G. Van Kewen, Durant
		* Guarantee
	W. F. CHAMBERLAIN FEED CO. St. Louis, Mo.	
18979	Chamberlain's Perfect Feed	J. H. Stevens & Son, Columbus
		Guarantee
	COLUMBIA STAR MILLING CO., Columbia, Ill.	
18681	Wheat Bran	Gulfport Grocery Co., Gulfport
		Guarantee
18995	Wheat Middlings	A. E. Dahlrymple & Son, Amory
		Guarantee
	L. P. COOK, Memphis, Tenn.	
18615	Old Miss. Chick Feed	G. T. Eggleston, Greenwood
		† Guarantee
18677	Old Miss. Stock Feed	O. W. Sturdivant, Winona
		Guarantee
18706	Wheat Shorts	C. H. Stevens Co., Richton
		Guarantee
	CORNO MILLS COMPANY, St. Louis, Mo.	
18616	Corno Chick Feed	Greenwood Groc. Co., Greenwood
18627	Corno Chick Feed	Belzoni Grocery Co., Belzoni
18668	Corno Chick Feed	Barrett Grocery Co., Lexington
18987	Corno Chick Feed	Gibson Grocery Co., West Point
		Guarantee

* No guarantee submitted; sale illegal.
† No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cdnt.	Crude Fiber—Per Cent.
18540	12.00	4.20	5.78	17.44	55.21	5.37
18550	10.26	3.74	5.39	17.88	58.47	4.26
18888	10.08	3.97	5.13	17.00	59.06	4.76
18887	10.28	4.13	5.41	17.38	58.41	4.39
			4.20	*15.50*	*60.30*	*3.70*
18576	10.68	2.58	3.76	9.13	72.31	1.54
			5.00	*10.50*	*69.60*	*3.10*
18655	9.70	5.30	3.04	9.94	56.50	15.52
18979	10.34	1.55	3.54	10.06	72.39	2.12
			3.50	*10.50*	*60.00*	*6.00*
18681	10.35	6.78	5.21	16.00	53.60	8.06
			3.74	*15.26*	*53.38*	*9.21*
18995	8.15	3.24	3.65	14.56	67.02	3.38
			5.02	*15.26*	*60.47*	*3.75*
18615	11.38	2.10	3.26	11.44	68.67	3.15
18677	10.95	8.32	4.38	13.63	53.10	9.62
			4.00	*13.00*	*55.00*	*11.50*
18706	10.93	3.72	4.78	17.06	59.59	3.92
			3.75	*15.00*	*55.00*	*9.50*
18616	11.32	1.85	3.22	10.50	70.92	2.19
18627	11.30	7.75	3.53	11.13	63.14	3.15
18668	11.54	2.30	3.17	10.50	70.38	2.11
18987	10.65	2.59	3.53	9.63	71.48	2.12
			3.50	*10.00*	*70.00*	*3.40*

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
18628	Corno Hen Feed	Belzoni Groc. Co., Belzoni
18672	Corno Hen Feed	Barrett Grocery Co., Lexington
18894	Corno Hen Feed	Hannah Distributing Co., Jackson
18900	Corno Hen Feed	P. P. Williams Co., Vicksburg
18938	Corno Hen Feed	P. H. Anderson & Co., Holly Sp'gs.
18972	Corno Hen Feed	J. L. Walker & Co., Columbus
18988	Corno Hen Feed	Gibson Grocery Co., West Point
		Guarantee
18618	Corno Horse & Mule Feed	Greenwood Groc. Co., Greenwood
18630	Corno Horse & Mule Feed	Yazoo Grocery Co., Yazoo City
18626	Corno Horse & Mule Feed	Belzoni Grocery Co., Belzoni
18625	Corno Horse & Mule Feed	T. H. Scott, Itta Bena
18607	Corno Horse & Mule Feed	Greenwood Groc. Co., Greenwood
18605	Corno Horse & Mule Feed	Self & Company, Marks
18592	Corno Horse & Mule Feed	Goyer & Company, Greenville
18583	Corno Horse & Mule Feed	Bolivar Merc. Co., Shaw
18577	Corno Horse & Mule Feed	P. P. Williams Co., Vicksburg
18647	Corno Horse & Mule Feed	J. F. Wilburn, Pickens
18666	Corno Horse & Mule Feed	C. W. Bacon, Vaiden
18671	Corno Horse & Mule Feed	Barrett Groc. Co., Lexington
18704	Corno Horse & Mule Feed	C. H. Stevens Co., Richton
18882	Corno Horse & Mule Feed	A. J. Lyons & Co., Meridian
18890	Corno Horse & Mule Feed	Brandon Merc. Co., Brandon
18895	Corno Horse & Mule Feed	Hannah Distributing Co., Jackson
18901	Corno Horse & Mule Feed	P. P. Williams Co., Vicksburg
18919	Corno Horse & Mule Feed	Postlethwait & Stewart Co., Natchez
18939	Corno Horse & Mule Feed	E. N. Reed, Iuka
*18946	Corno Horse & Mule Feed	Corinth Grocery Co., Corinth
*19289	Corno Horse & Mule Feed	Corinth Grocery Co., Corinth
18970	Corno Horse & Mule Feed	J. L. Walker & Co., Columbus
18986	Corno Horse & Mule Feed	Gibson Grocery Co., West Point
19003	Corno Horse & Mule Feed	Chas. O. Houghton, Aberdeen
		Guarantee
	CYPHERS INCUBATOR CO., Buffalo, N. Y.	
18613	Chick Food	J. F. Melton, Greenwood
18621	Chick Food	G. A. Wilson, Jr., Greenwood
		† Guarantee
18612	Scratching Food	J. F. Melton, Greenwood
		† Guarantee
	DAHNKE-WALKER MILLING COMPANY, Union City, Tenn.	
18885	Wheat Bran	Macon Merc. Co., Macon
18886	Wheat Bran	A. Klaus & Co., Macon
		Guarantee

* Nos. 18946 and 19289 were drawn from the same shipment.
† No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18628	10.87	2.93	2.97	10.63	70.08	2.52
18672	11.34	1.29	3.17	10.06	72.33	1.81
18894	11.51	1.43	2.94	9.75	72.30	2.07
18900	12.14	1.51	3.63	10.44	70.24	2.04
18938	9.85	1.50	3.53	9.69	73.34	2.09
18972	9.22	1.35	3.09	9.81	74.70	1.83
18988	10.00	1.40	3.50	9.50	73.54	2.06
			3.50	*10.00*	*68.00*	*5.00*
18618	9.86	3.79	4.25	10.63	60.59	10.88
18630	10.98	3.46	3.94	10.94	60.90	9.88
18626	9.38	4.65	4.10	11.06	59.49	11.32
18625	9.44	4.34	3.86	11.38	61.19	9.79
18607	11.21	4.28	3.64	10.94	58.10	11.83
18605	10.86	4.15	3.89	10.88	57.89	12.33
18592	9.72	4.45	4.09	11.56	58.90	11.28
18583	10.37	4.69	3.91	10.94	56.68	13.41
18577	7.80	4.18	3.80	10.94	62.54	10.74
18647	9.09	4.30	3.78	10.56	60.93	11.34
18666	8.53	4.27	3.92	11.75	60.83	10.70
18671	10.02	3.73	3.97	10.56	59.93	11.79
18704	11.16	4.08	3.94	10.75	58.74	11.33
18882	11.38	3.62	3.55	10.31	60.72	10.42
18890	10.71	4.27	3.87	10.94	59.15	11.06
18895	10.09	4.07	3.64	10.38	60.27	11.55
18901	10.56	3.61	3.88	10.25	62.30	9.40
18919	10.05	4.15	4.33	10.13	60.57	10.77
18939	9.66	4.50	3.82	11.06	59.84	11.12
18946	10.92	3.87	3.15	10.38	61.41	10.27
19289	8.12	4.06	3.62	10.94	62.92	10.34
18970	9.05	3.86	3.68	10.75	63.72	8.94
18986	8.24	4.16	3.39	10.44	62.81	10.96
19003	9.19	3.52	3.71	10.75	62.89	9.94
			3.50	*10.00*	*58.50*	*12.00*
18613	11.07	3.63	2.72	11.06	69.84	1.68
18621	11.80	6.45	2.83	11.31	65.77	1.84
18612	10.90	3.74	3.45	11.00	68.69	2.22
18885	9.24	6.86	4.98	14.00	56.12	8.80
18886	8.38	6.45	5.01	14.44	57.63	8.09
			3.95	*14.00*	*55.00*	*10.50*

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	DAVIS & ANDREWS COMPANY, Memphis, Tenn.	
19001	Wheat Bran	Carlisle & Taylor, Aberdeen
		Guarantee
18593	Hominy Feed	Goyer Company, Greenville
		Guarantee
18999	Wheat Shorts	Gilmore, Puckett Groc. Co., Amory
		Guarantee
	DOMESTIC FLOUR MILLING CO. Kansas City, Mo.	
18572	Wheat Bran	Hanes & Hood, Vicksburg
18579	Wheat Bran	E. Bonelli, Vicksburg
18663	Wheat Bran	J. Niles Boyd, Kosciusko
18928	Wheat Bran	Davis Mize & Call, Oxford
18949	Wheat Bran	L. L. Brown Prod. Co., Booneville
		Guarantee
18674	Wheat Middlings	Small & Moore, Winona
18877	Wheat Middlings	R. W. Fagan, Waynesboro
18883	Wheat Middlings	Queen City Feed Store, Meridian
18889	Wheat Middlings	Walton Bros., Newton
18940	Wheat Middlings	C. W. McKnight, Iuka
18942	Wheat Middlings	Farmers Warehouse Co., Iuka
18948	Wheat Middlings	L. L. Brown Prod. Co., Booneville
18961	Wheat Middlings	S. W. Pegram, Ripley
18967	Wheat Middlings	Hall, Weaver Groc. Co., Houston
18968	Wheat Middlings	Houston Ice & Coal Co., Houston
18985	Wheat Middlings	Gibson Grocery Co., West Point
		Guarantee
18643	Wheat Shorts	Taylor-Wills Groc. Co., Jackson
18661	Wheat Shorts	J. Niles Boyd, Kosciusko
18884	Wheat Shorts	Winner-Klein Co., Meridian
18929	Wheat Shorts	Davis Mize & Call, Oxford
		* Guarantee
	EDGAR-MORGAN COMPANY, Memphis, Tenn.	
18591	Ceralfa Stock Feed	Goyer Company, Greenville
18629	Ceralfa Stock Feed	Yazoo Grocery Co., Yazoo City
18620	Ceralfa Stock Feed	G. A. Wilson, Jr., Greenwood
18578	Ceralfa Stock Feed	R. L. Crook & Co., Vicksburg
18652	Ceralfa Stock Feed	Durant Ice & Coal Co., Durant
18658	Ceralfa Stock Feed	Tchula Co-Operative Store, Tchula
18669	Ceralfa Stock Feed	Barrett Grocery Co., Lexington
18673	Ceralfa Stock Feed	Bingham & Company, Carrollton
		Guarantee
18651	Manna Hen Feed	Durant Ice & Coal Co., Durant
		Guarantee

* No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
19001	9.72	6.23	4.91	16.56	54.37	8.21
			3.50	*10.00*	*54.00*	*10.50*
18593	10.44	1.92	6.35	11.19	65.79	4.31
			5.00	*9.00*	*60.00*	*9.00*
18999	9.99	4.15	4.08	15.75	61.39	4.64
			3.50	*10.00*	*54.00*	*10.50*
18572	7.66	6.92	4.59	17.25	54.54	9.04
18579	9.82	6.57	4.67	17.75	52.95	8.24
18663	8.49	8.10	4.92	16.00	52.88	9.61
18928	8.92	6.39	4.12	16.38	55.10	9.09
18949	10.49	6.42	4.54	15.88	54.74	7.93
			4.00	*14.50*	*56.00*	*10.00*
18674	10.30	7.59	5.06	17.38	54.73	4.94
18877	11.18	5.10	5.26	18.75	54.88	4.83
18883	12.31	3.56	5.00	16.06	59.24	3.83
18889	10.14	4.58	5.58	17.63	56.77	5.30
18940	8.25	5.00	5.90	17.44	58.45	4.96
18942	8.71	3.72	4.44	16.06	62.46	4.61
18948	10.34	4.35	4.87	17.19	58.70	4.55
18961	9.25	4.96	5.63	20.13	54.66	5.37
18967	9.29	4.74	5.80	19.63	55.59	4.95
18968	9.12	3.82	5.70	16.19	60.61	4.56
18985	9.20	4.32	5.35	17.63	58.63	4.87
			4.00	*15.00*	*56.00*	*7.00*
18643	8.95	4.58	4.96	17.94	59.52	4.05
18661	10.57	5.84	4.85	17.31	57.33	4.10
18884	12.17	5.88	5.09	18.25	52.21	6.40
18929	8.40	4.62	5.23	17.69	58.93	5.13
18591	10.07	7.44	4.26	14.06	54.87	9.30
18629	10.12	8.82	4.00	13.81	54.55	8.70
18620	10.18	7.74	4.04	13.19	56.38	8.47
18578	8.36	7.11	4.13	13.94	57.50	8.96
18652	11.91	5.89	4.06	13.06	56.65	8.43
18658	9.53	6.57	4.03	13.19	57.68	9.00
18669	10.46	6.39	4.18	13.00	56.11	9.86
18673	10.39	7.22	3.91	14.00	55.14	9.34
			4.00	*13.00*	*55.00*	*11.50*
18651	10.10	1.78	4.02	10.13	71.58	2.39
			3.50	*10.00*	*60.00*	*5.00*

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
18595	Manna Rice Special Chick Feed	Goyer Company, Greenville
18650	Manna Rice Special Chick Feed	The Miss. Company, Canton
		Guarantee
18653	Manna Superb Chick Feed	Durant Ice & Coal Co., Durant
		Guarantee
	EGGERS MILLING COMPANY, Hermann, Mo.	
18635	Bran	D. W. Wilkinson & Bro., Jackson
18892	Bran	D. W. Wilkinson & Bro., Jackson
		Guarantee
18636	Shipstuff	D. W. Wilkinson & Bro., Jackson
18891	Shipstuff	D. W. Wilkinson & Bro., Jackson
		Guarantee
	EISENMEYER MILLING CO., Springfield, Mo.	
18997	Mill Run Bran & Shorts	Gilmore May Co., Amory
		* Guarantee
18996	Wheat Middlings	Gilmore May Co., Amory
		Guarantee
	A. H. GEORGE & COMPANY, Meridian, Miss.	
18881	George's Prepared Cow & Cattle Feed	A. H. George Co., Meridian
		Guarantee
18880	George's Mixed Rice Shorts	A. H. George Co., Meridian
		Guarantee
	B. F. GLOVER & SONS COM. CO., New Orleans, La.	
18873	Wheat Shorts	Hand Bros., Ellisville
		Guarantee
	GREAT WESTERN CEREAL CO., Chicago, Ill.	
18623	Boss Feed	G. T. Eggleston, Greenwood
18580	Boss Feed	Sol Fried Co., Vicksburg
18642	Boss Feed	Taylor-Wills Groc. Co., Jackson
18646	Boss Feed	N. & W. Tucker, Pickens
18657	Boss Feed	Tchula Commercial Co., Tchula
†18936	Boss Feed	A. L. McCormick, Senatobia
†19288	Boss Feed	A. L. McCormick, Senatobia
		Guarantee

* No guarantee submitted; sale illegal.

† Nos. 18936 and 19288 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18595	11.05	3.06	2.53	12.31	67.04	4.01
18650	10.23	2.86	2.62	12.38	67.92	3.99
			3.50	*11.00*	*65.00*	*4.00*
18653	11.31	9.57	3.50	12.06	59.07	4.49
			3.50	*10.00*	*60.00*	*5.00*
18635	8.84	7.80	4.91	16.88	53.56	8.01
18892	10.09	7.86	4.90	15.69	52.72	8.74
			4.50	*15.00*	*54.00*	*9.25*
18636	9.79	4.10	5.32	17.75	58.98	4.06
18891	9.54	5.88	5.53	17.63	56.72	4.70
			4.50	*14.25*	*60.10*	*4.50*
18997	7.80	4.62	4.58	17.50	59.70	5.80
18996	9.03	1.19	3.37	16.69	69.18	.54
			4.50	*15.75*	*60.00*	*6.00*
18881	8.33	3.86	4.41	12.44	62.14	8.82
			4.00	*11.00*	*38.00*	*40.00*
18880	11.47	7.65	10.80	12.00	53.02	5.06
			5.00	*10.00*	*50.00*	*6.50*
18873	10.27	4.37	5.53	17.88	57.08	4.87
			4.50	*14.90*	*56.80*	*7.40*
18623	9.36	5.25	4.14	9.69	65.40	6.16
18580	7.95	4.22	4.01	9.63	66.77	7.42
18642	8.10	3.43	4.02	9.56	67.45	7.44
18646	8.48	3.35	4.15	9.13	67.77	7.12
18657	8.65	4.12	4.20	9.13	65.57	8.33
18936	8.57	2.74	3.93	8.44	68.57	7.75
19288	7.07	2.56	3.99	8.56	69.84	7.98
			4.00	*9.50*	*60.00*	*10.00*

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
*18645	Daisy Dairy Feed	Taylor-Wills Grocery Co., Jackson
*19276	Daisy Dairy Feed	Taylor-Wills Grocery Co., Jackson
		† Guarantee
18915	Durham Feed	I. Lowenberg & Co., Natchez
		Guarantee
18667	Excelsior Feed	T. H. Armstrong & Bro., Vaiden
18893	Excelsior Feed	R. H. Green & Bro., Jackson
†18957	Excelsior Feed	Clark Grocery Co., Tupelo
†19292	Excelsior Feed	Clark Grocery Co., Tupelo
		Guarantee
18624	Mazo Feed	G. T. Eggleston, Greenwood
		Guarantee
18945	Sterling Chick Feed	Morrison, Rinehart Gro. Co., Cor'th
		Guarantee
	GULFPORT GROCERY CO., Gulfport, Miss.	
18684	Big Bucket Cow Feed	Gulfport Grocery Co., Gulfport
18709	Big Bucket Cow Feed	Anderson Merc. Co., Richton
		Guarantee
18682	Mile Post Feed	Gulfport Grocery Co., Gulfport
18689	Mile Post Feed	Union Naval Stores, Gulfport
18697	Mile Post Feed	Biloxi Milling Co., Biloxi
18708	Mile Post Feed	Anderson Merc. Co., Richton
		Guarantee
18683	Nek-Yok Ox Feed	Gulfport Grocery Co., Gulfport
		Guarantee
	HANNAH DISTRIBUTING CO., Jackson, Miss.	
18897	Wheat Bran	Hannah Distributing Co., Jackson
		Guarantee
18896	Mixed Feed	Hannah Distributing Co., Jackson
		Guarantee
	HARRIS & COMPANY, Meridian, Miss.	
18678	Tip Top Cattle Feed	McLeod & Co., Purvis
		Guarantee
	HUNTER ROBINSON WENZ MILLING COMPANY, St. Louis, Mo.	
18874	Dreadnaught Wheat Bran	Hand Bros., Ellisville
		Guarantee
18695	Rustic Midds	Biloxi Milling Co., Biloxi
		Guarantee
18582	Sunshine Mixed Feed	W. O. Worrell, Vicksburg
		‡ Guarantee

* Nos. 18645 and 19276 were drawn from the same shipment.
† Nos. 18957 and 19292 were drawn from the same shipment.
‡ No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18645	9.57	9.06	2.22	19.00	49.32	10.83
19276	9.92	7.88	2.20	19.88	51.39	8.73
18915	9.26	3.80	4.46	14.06	60.52	7.90
			4.00	*9.50*	*60.00*	*10.00*
18667	10.25	3.49	4.31	10.50	63.94	7.51
18893	10.18	4.01	4.28	10.13	64.50	6.90
18957	8.00	3.53	3.79	9.19	68.54	6.95
19292	6.65	4.30	4.41	9.19	68.34	7.11
			4.00	*9.50*	*60.00*	*10.00*
18624	9.72	3.76	4.10	11.00	62.40	9.02
			4.00	*10.00*	*60.00*	*11.00*
18945	9.75	1.40	3.21	11.00	73.29	1.35
			3.50	*10.00*	*65.00*	*4.00*
18684	9.91	4.89	4.20	16.00	44.74	20.26
18709	10.16	5.26	3.00	16.31	43.71	21.56
			3.50	*10.00*	*45.00*	*25.00*
18682	10.95	3.60	4.09	11.63	62.16	7.57
18689	10.39	3.74	3.84	12.13	62.40	7.50
18697	11.54	4.14	3.50	12.13	60.52	8.17
18708	11.22	4.90	3.90	12.31	57.21	10.46
			3.50	*10.00*	*57.50*	*12.00*
18683	9.99	4.35	3.66	13.75	46.85	21.40
			3.50	*10.00*	*40.00*	*25.00*
18897	9.33	5.62	4.55	15.69	57.52	7.29
			3.50	*12.00*	*54.00*	*9.00*
18896	10.27	4.64	5.62	18.13	56.74	4.60
			3.50	*10.00*	*55.00*	*12.00*
18678	9.25	4.15	2.90	10.13	41.70	31.87
			3.50	*12.50*	*29.24*	*33.81*
18874	10.11	6.08	4.49	16.00	55.52	7.80
			4.00	*14.50*	*55.00*	*9.50*
18695	12.07	4.60	5.64	20.56	51.69	5.44
			4.00	*15.00*	*55.00*	*6.00*
18582	10.44	5.45	4.42	16.88	55.30	7.51

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	ILLINOIS FEED MILLS, St. Louis, Mo.	
18589	Chicken Feed	McMahon Groc. Co., Greenville
18991	Chicken Feed, Chick Size	Davis & Chandler, West Point
18990	Chicken Feed, Scratch Size	Davis & Chandler, West Point
		Guarantee
18601	Star Feed	Delta Groc. & Cotton Co., C'ksdale
18587	Star Feed	McMahon Groc. Co., Greenville
18633	Star Feed	L. G. & J. T. Montgomery, Yazoo C'
18571	Star Feed	Hanes & Hood, Vicksburg
18904	Star Feed	Hanes & Hood, Vicksburg
		Guarantee
	INTERNATIONAL SUGAR FEED NO. 2 COMPANY, Memphis, Tenn.	
18701	International Cow Feed	W. M. Couty, Pascagoula
		Guarantee
18585	International Horse & Mule Feed	G. W. Faison, Jr., Shaw
18599	International Horse & Mule Feed	C. R. Smith, Cleveland
18686	International Horse & Mule Feed	Hood Milling Co., Gulfport
18700	International Horse & Mule Feed	W. M. Couty, Pascagoula
18982	International Horse & Mule Feed	The Walter Fisher Co., West Point
		Guarantee
18983	International Poultry Feed, Chick Size	The Walter Fisher Co., West Point
		Guarantee
18984	International Poultry Feed, Scratch Size	The Walter Fisher Co., West Point
		Guarantee
	KINGFALFA MILLS, Nebraska City, Neb.	
18640	Grain Mix Chick Feed	R. H. Green & Bro., Jackson
		Guarantee
18644	Grain Mix Scratch Feed	Taylor-Wills Groc. Co., Jackson
		Guarantee
*18639	Kingfalfa Horse Feed	R. H. Green & Bro., Jackson
*19275	Kingfalfa Horse Feed	R. H. Green & Bro., Jackson
		Guarantee

* Nos. 18639 and 19275 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18589	9.07	15.84	2.80	8.94	60.98	2.37
18991	9.04	2.14	3.87	10.56	71.86	2.53
18990	9.82	1.77	3.33	10.31	72.10	2.67
			3.50	*10.00*	*60.00*	*6.00*
18601	10.81	6.58	4.96	15.06	52.71	9.88
18587	10.02	4.52	4.13	14.56	57.07	9.70
18633	9.58	5.04	4.57	13.94	57.62	9.25
18571	8.21	4.23	4.23	13.75	60.98	8.60
18904	10.15	6.00	4.74	13.19	57.41	8.51
			3.80	*12.00*	*58.00*	*8.90*
18701	15.42	8.03	4.12	14.00	48.49	9.94
			3.50	*16.50*	*52.50*	*12.00*
18585	11.35	7.67	4.98	13.44	52.96	9.60
18599	12.08	7.93	3.95	12.56	53.76	9.72
18686	11.00	7.90	3.66	12.81	55.08	9.55
18700	13.74	7.44	4.68	12.69	53.19	8.26
18982	10.45	6.43	3.82	12.94	56.84	9.52
			3.50	*12.50*	*50.00*	*12.00*
18983	11.12	2.37	3.34	12.50	68.07	2.60
			3.50	*10.00*	*70.00*	*5.00*
18984	10.27	2.16	2.73	10.88	71.62	2.34
			3.50	*10.00*	*70.00*	*5.00*
18640	11.26	2.18	3.39	10.50	70.33	2.34
			3.50	*11.00*	*60.00*	*6.00*
18644	10.38	4.13	2.94	10.19	70.38	1.98
			3.50	*11.00*	*60.00*	*6.00*
18639	11.40	7.21	2.84	13.13	58.03	7.39
19275	14.11	6.31	2.58	12.94	56.51	7.55
			3.50	*10.25*	*55.00*	*12.00*

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	KEMPER MILL & ELEVATOR COMPANY, Kansas City, Mo.	
18638	Wheat Bran	McClelland & Smith, Jackson
		Guarantee
18637	Shorts	McClelland & Smith, Jackson
		Guarantee
	KORNFALFA FEED MILLING COMPANY, Kansas City, Mo.	
18690	Kornfalfa Feed	Union Naval Stores, Gulfport
18679	Kornfalfa Feed	J. S. Adkinson, McHenry
		Guarantee
	LIBERTY MILLS, Nashville, Tenn.	
18617	Wheat Bran	Greenwood Groc. Co., Greenwood
18971	Wheat Bran	J. L. Walker & Co., Columbus
		Guarantee
18947	Wheat Shorts	L. L. Brown Prod. Co., Booneville
18975	Wheat Shorts	Donaghue & Dee & Co., Columbus
		Guarantee
	McDONALD HAY & GRAIN CO., Memphis, Tenn.	
18608	McDonald's Special Alfalfa Mixed Feed	J. F. Melton, Greenwood
18604	McDonald's Special Alfalfa Mixed Feed	W. S. Campbell, Clarksdale
18930	McDonald's Special Alfalfa Mixed Feed	Farmers Warehouse Co., Charleston
18941	McDonald's Special Alfalfa Mixed Feed	Farmers Warehouse Co., Iuka
		Guarantee
	McINNIS & STURGIS, Meridian, Miss.	
18876	Wheat Bran	R. W. Fagan & Co., Waynesboro
		* Guarantee
	MARCO MILLS, Pine Bluff, Ark.	
18574	Chops	P. P. Williams Co., Vicksburg
		Guarantee

* No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18638	9.26	7.51	4.81	15.38	52.64	10.40
			4.00	*14.50*	*53.50*	*9.50*
18637	9.64	4.80	6.59	18.44	55.85	4.68
			5.25	*15.50*	*61.25*	*6.25*
18690	9.95	4.60	3.62	11.25	60.88	9.70
18679	10.87	4.13	4.15	10.56	61.66	8.63
			3.50	*11.00*	*60.00*	*12.00*
18617	8.66	8.78	4.95	14.06	54.76	8.79
18971	8.24	6.00	4.58	15.38	58.29	7.51
			4.00	*14.50*	*50.00*	*9.50*
18947	9.47	4.94	5.58	17.94	56.89	5.18
18975	10.82	4.94	5.53	17.38	55.86	5.47
			4.00	*16.00*	*48.00*	*6.00*
18608	10.32	4.51	3.40	10.13	59.07	12.57
18604	10.24	4.25	4.10	11.06	59.73	10.62
18930	8.42	4.07	3.14	11.13	62.51	10.73
18941	8.17	3.74	3.33	9.94	64.81	10.01
			3.50	*10.00*	*58.00*	*12.00*
18876	9.82	7.64	4.86	15.19	52.32	10.17
18574	9.28	1.29	3.74	9.13	75.13	1.43

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	MEEK MILLING COMPANY, Marissa, Ill.	
18634	Wheat Bran and Ground Wheat Screenings	L. G. & J. T. Montgomery, Yazoo C'y
		Guarantee
18675	Wheat Shorts	Hitt, Hart & Blackston Co., Winona
18676	Wheat Shorts	O. W. Sturdivant, Winona
18875	Wheat Shorts	Ruffin Merc. Co., Ellisville
18965	Wheat Shorts	W. R. Davis, Houston
		Guarantee
	MILLSTADT MILLING CO., Millstadt, Ill.	
*18879	Palace Horse Feed	Threefoot Bros. & Co., Meridian
*19279	Palace Horse Feed	Threefoot Bros. & Co., Meridian
†18871	Palace Horse Feed	Hand Bros., Ellisville
†19278	Palace Horse Feed	Hand Bros., Ellisville
		Guarantee
	NATIONAL FEED COMPANY, St. Louis, Mo.	
18641	Wheat Bran	R. H. Green & Bro., Jackson
18688	Wheat Bran	Union Naval Stores, Gulfport
18902	Wheat Bran	E. Bonelli & Co., Vicksburg
		Guarantee
18702	Wheat Middlings	DeJean Mitchell Co., Pascagoula
		Guarantee
	NEW ATHENS MILLING CO., New Athens, Ill.	
18707	Bran	Dorsett & Co., Richton
		Guarantee
	NEW BASIN WAREHOUSE & ELEVATOR CO., New Orleans, La.	
18870	Best-O-Feed	Buckley Terry Co., Laurel
		‡ Guarantee
	NUTRILINE MILLING CO., Crowley, La.	
*a*18691	Nutriline	W. A. McDonald, Bay St. Louis
*a*19277	Nutriline	W. A. McDonald, Bay St. Louis
		Guarantee

* Nos. 18879 and 19279 were drawn from the same shipment.
† Nos. 18871 and 19278 were drawn from the same shipment.
‡ No guarantee submitted; sale illegal.
a Nos. 18691 and 19277 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18634	9.48	5.81	4.84	16.13	55.66	8.08
			3.50	*13.50*	*50.00*	*12.00*
18675	10.61	5.42	3.58	15.88	60.97	3.54
18676	10.87	3.62	4.65	15.50	61.71	3.65
18875	10.41	4.24	5.06	16.44	59.93	3.92
18965	9.35	3.65	5.12	15.94	61.46	4.48
			3.50	*13.50*	*54.00*	*8.50*
18879	9.70	5.45	3.31	12.63	56.93	11.98
19279	11.09	4.46	3.27	12.06	59.42	9.70
18871	10.03	3.61	3.09	12.06	59.23	11.98
19278	9.83	4.80	3.02	11.25	59.30	11.80
			3.51	*11.81*	*59.96*	*11.80*
18641	8.78	5.42	4.70	15.94	58.24	6.92
18688	10.20	5.83	4.73	18.44	53.23	7.57
18902	11.87	6.33	4.64	14.38	54.22	8.56
			4.00	*14.00*	*54.00*	*9.50*
18702	10.63	4.72	5.73	18.19	55.52	5.21
			4.00	*16.00*	*56.00*	*7.00*
18707	10.99	5.82	4.80	16.56	54.43	7.40
			3.50	*14.00*	*55.00*	*9.50*
18870	10.97	3.14	4.47	10.25	65.67	5.50
18691	11.21	8.97	5.49	10.88	54.09	9.36
19277	11.01	9.17	4.90	9.94	55.55	9.43
			3.50	*12.00*	*58.00*	*10.00*

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	G. E. PATTESON & CO., Memphis, Tenn.	
18600	Sugaration Stock Feed	Rogers & Jacobs Co., Shelby
18662	Sugaration Stock Feed	J. Niles Boyd, Kosciusko
		Guarantee
	GEO. P. PLANT MILLING CO., St. Louis, Mo.	
18588	Wheat Bran	McMahon Grocery Co., Greenville
18685	Wheat Bran	Hood Milling Co., Gulfport
18908	Wheat Bran	A. Beer & Company, Natchez
18913	Wheat Bran	I. Lowenberg & Co., Natchez
18912	Wheat Bran	Geisenberger & Friedler, Natchez
18918	Wheat Bran	Rumble & Wensel Co., Natchez
18917	Wheat Bran	Rumble & Wensel Co., Natchez
18943	Wheat Bran	Farmers Warehouse Co., Iuka
		Guarantee
18907	Wheat Middlings	A. Beer & Co., Natchez
18914	Wheat Middlings	I. Lowenberg & Co., Natchez
		Guarantee
	QUAKER OATS COMPANY, Chicago, Ill.	
18596	Banner Feed	Miss. Feed Co., Greenville
*18573	Banner Feed	P. P. Williams Co., Vicksburg
*18863	Banner Feed	P. P. Williams Co., Vicksburg
18603	Banner Feed	Clark, Herrin, Campbell Co., C'dale
18910	Banner Feed	R. Viener & Co., Natchez
18911	Banner Feed	Geisenberger & Friedler, Natchez
		Guarantee
18670	Blue Ribbon Feed	Barrett Grocery Co., Lexington
		Guarantee
18575	Schumacher Chick Feed	P. P. Williams Co., Vicksburg
18909	Schumacher Chick Feed	R. Viener & Co., Natchez
		Guarantee
18619	Schumacher Stock Feed	Greenwood Grocery Co., Greenwood
		Guarantee
†18935	Schumacher Special Horse Feed	Clayston & Pearson, Sardis
†19287	Schumacher Special Horse Feed	Clayston & Pearson, Sardis
‡18954	Schumacher Special Horse Feed	Weaver & Azwell, Tupelo
‡19291	Schumacher Special Horse Feed	Weaver & Azwell, Tupelo
*a*18993	Schumacher Special Horse Feed	Tobe Davis, Nettleton
*a*19295	Schumacher Special Horse Feed	Tobe Davis, Nettleton

* Nos. 18573 and 18863 were drawn from the same shipment.
† Nos. 18935 and 19287 were drawn from the same shipment.
‡ Nos. 18954 and 19291 were drawn from the same shipment.
a Nos. 18993 and 19295 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18600	12.68	6.27	5.14	16.06	51.05	8.80
18662	11.81	5.22	3.52	12.63	59.11	7.71
			3.50	*11.65*	*64.00*	*11.04*
18588	9.48	6.34	4.65	16.25	54.18	9.10
18685	10.22	6.24	4.78	17.31	53.60	7.85
18908	10.50	6.63	5.22	16.13	53.81	7.71
18913	10.01	6.33	5.27	16.38	53.31	8.70
18912	10.23	6.46	5.18	16.19	53.88	8.06
18918	9.68	6.75	4.82	15.38	54.28	9.09
18917	10.17	3.92	5.43	15.00	60.10	5.38
18943	9.12	6.92	4.51	16.56	54.04	8.85
			4.00	*16.00*	*54.00*	*9.00*
18907	10.10	3.67	4.48	17.25	60.50	4.00
18914	10.17	4.61	5.34	17.50	58.29	4.09
			4.41	*17.11*	*59.18*	*5.18*
18596	8.35	3.95	3.78	10.31	65.29	8.32
18573	8.40	4.23	3.51	10.50	65.11	8.25
18863	10.28	3.67	3.57	10.13	63.68	8.67
18603	9.54	3.48	3.77	10.44	63.91	8.86
18910	10.24	3.86	3.85	9.81	63.74	8.50
18911	9.81	3.50	4.41	9.69	64.52	8.07
			3.75	*9.75*	*63.00*	*10.50*
18670	9.80	3.29	3.93	10.31	64.33	8.34
			3.75	*9.75*	*63.00*	*10.50*
18575	8.61	1.77	3.55	11.69	72.18	2.20
18909	11.28	3.36	4.07	10.44	68.88	1.97
			3.50	*10.00*	*60.00*	*5.00*
18619	9.06	4.21	4.86	11.50	60.89	9.48
			4.00	*10.00*	*62.00*	*10.00*
18935	7.88	3.02	3.57	9.88	69.75	5.90
19287	8.61	2.85	3.69	9.81	69.03	6.01
18954	9.20	2.78	3.77	9.88	68.25	6.12
19291	8.18	2.79	4.29	9.75	69.02	5.97
18993	10.01	2.44	3.28	9.31	68.76	6.20
19295	7.21	3.53	2.99	9.81	66.72	9.74

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
*18998	Schumacher Special Horse Feed	Gilmore May Co., Amory
*19296	Schumacher Special Horse Feed	Gilmore May Co., Amory
		Guarantee
	RALSTON PURINA COMPANY, St. Louis, Mo.	
18581	Chicken Feed	W. O. Worrill, Vicksburg
18594	Chicken Feed	Goyer Company, Greenville
18622	Chicken Feed	G. A. Wilson, Jr., Greenwood
18602	Chicken Feed	Delta Grocery & Cot. Co., Cl'ksdale
18680	Chicken Feed, Scratch Size	Gulfport Grocery Co., Gulfport
18696	Chicken Feed, Scratch Size	Biloxi Milling Co., Biloxi
18906	Chicken Feed	Hanes & Hood, Vicksburg
18953	Chicken Feed, Scratch Size	Reeves Grocery Co., Tupelo
18978	Chicken Feed	Robertson & Co., Columbus
		Guarantee
18568	Purina Feed	T. E. Winn, Laurel
18631	Purina Feed	Yazoo Grocery Co., Yazoo City
18590	Purina Feed	The Goyer Co., Greenville
18966	Purina Feed	Gray & Pearson, Houston
		Guarantee
†18569	Purina Molasses Feed	T. E. Winn, Laurel
†18862	Purina Molasses Feed	T. E. Winn, Laurel
‡18905	Purina Molasses Feed	Hanes & Hood, Vicksburg
‡19282	Purina Molasses Feed	Hanes & Hood, Vicksburg
*a*18916	Purina Molasses Feed	Rumble & Wensel Co., Natchez
*a*19283	Purina Molasses Feed	Rumble & Wensel Co., Natchez
*h*18950	Purina Molasses Feed	L. L. Brown Produce Co., B'ville
*h*19290	Purina Molasses Feed	L. L. Brown Produce Co., B'ville
		Guarantee
	RANDOLPH MILLING CO., Baldwin, Ill.	
19000	Randolph Bran	L. S. Cunningham, Aberdeen
		Guarantee
	W. M. RINGO, Clinton, Ky.	
18924	Mixed Feed	F. S. Leavell, Oxford
		Guarantee
	ROBERTS & HAMNER GRAIN COMPANY, Memphis, Tenn.	
18606	Graino Alfalfa Mixed Feed	J. E. Bell Supply Co., Lambert
18962	Graino Alfalfa Mixed Feed	C. M. Elder, New Albany
18969	Graino Alfalfa Mixed Feed	Houston Ice & Coal Co., Houston
		Guarantee

* Nos. 18998 and 19296 were drawn from the same shipment.
† Nos. 18569 and 18862 were drawn from the same shipment.
‡ Nos. 18905 and 19282 were drawn from the same shipment.
a Nos. 18916 and 19283 were drawn from the same shipment.
h Nos. 18950 and 19290 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18998	7.15	2.37	3.13	9.75	73.24	4.36
19296	8.09	2.49	3.80	9.06	70.26	6.30
			4.00	*10.00*	*62.00*	*8.00*
18581	10.75	1.75	3.61	11.38	69.89	2.62
18594	11.27	12.37	4.45	11.50	58.14	2.27
18622	11.57	2.08	3.62	10.81	69.32	2.60
18602	11.98	2.45	3.91	10.81	67.88	2.97
18680	10.72	1.88	3.77	10.19	70.91	2.53
18696	12.22	2.28	3.19	10.13	69.68	2.50
18906	12.16	1.88	4.05	10.13	69.28	2.50
18953	10.87	2.62	3.15	10.19	70.35	2.82
18978	9.99	1.64	3.29	10.25	72.27	2.56
			3.60	*11.00*	*65.00*	*4.00*
18568	8.43	4.31	4.87	14.06	59.91	8.42
18631	11.17	3.82	4.02	13.63	58.90	8.46
18590	10.11	4.69	4.13	17.75	54.39	8.93
18966	9.24	3.67	4.32	14.25	60.55	7.97
			4.00	*12.50*	*58.00*	*8.90*
18569	7.43	5.24	3.04	11.94	64.63	7.72
18862	9.36	[illegible]	2.90	11.69	60.54	8.85
18905	12.46	5.20	3.27	10.81	60.09	8.17
19282	12.96	6.35	2.31	12.00	56.21	10.17
18916	13.43	5.60	3.10	12.63	56.65	8.59
19283	12.59	5.58	2.76	11.06	59.35	8.66
18950	7.88	5.53	3.22	11.06	61.83	10.48
19290	9.48	5.98	3.32	11.44	61.06	8.72
			4.50	*11.50*	*59.00*	*10.00*
19000	8.71	6.22	4.55	14.69	56.73	9.10
			3.50	*14.50*	*50.00*	*10.62*
18924	8.19	5.58	4.75	14.94	59.70	6.84
			4.00	*12.00*	*50.00*	*10.00*
18606	9.77	5.00	4.79	12.00	55.37	13.07
18962	10.30	5.32	4.69	11.56	56.67	11.46
18969	8.53	4.87	4.87	12.75	58.72	10.26
			4.00	*12.00*	*54.00*	*10.00*

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	ROBINSON-DANFORTH CO., St. Louis, Mo.	
18973	Chicken Feed	C. C. Richardson & Co., Columbus
18974	Chicken Feed	C. C. Richardson & Co., Columbus
		Guarantee
	RUTHERFORD MILLING CO., Rutherford, Tenn.	
18952	Mill Run Bran	J. J. Rogers & Son, Tupelo
		Guarantee
	SAUERS MILLING COMPANY, Evansville, Ill.	
18659	Wheat Bran	W. B. Potts & Sons, Kosciusko
		Guarantee
18660	Shipstuff	W. B. Potts & Sons, Kosciusko
		Guarantee
	SAXONY MILLS, St. Louis, Mo.	
18692	Wheat Bran and Wheat Screenings	W. A. McDonald, Bay St. Louis
		* Guarantee
	SCOTT COUNTY MILLING CO., Sikeston, Mo.	
18878	Wheat Bran	Threefoot Bros. & Co., Meridian
		Guarantee
18989	Wheat Shorts	Davis & Chandler, West Point
		* Guarantee
	STAFOLIFE FEED & MILLING COMPANY, New Orleans, La.	
18872	Derby Horse & Mule Feed	Hand Bros., Ellisville
		Guarantee
18698	Stafolife	Biloxi Milling Co., Biloxi
18694	Stafolife	M. M. Moody, Long Beach
18665	Stafolife	Jackson-Wallace Co., Kosciusko
18570	Stafolife	Foote-Patrick Co., Laurel
		Guarantee
18699	Stafolife Poultry Feed	Corso & Tedesco, Biloxi
		Guarantee
	STANARD-TILTON MILLING CO. St. Louis, Mo.	
18654	Wheat Bran	Durant Ice & Coal Co., Durant
18705	Wheat Bran	C. H. Stevens Co., Richton

* No guarantee submitted; sale illegal.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18973	9.82	2.23	4.07	11.38	70.15	2.35
18974	11.17	1.86	3.22	10.44	70.44	2.54
			3.50	*10.00*	*60.00*	*6.00*
18952	9.18	5.10	4.33	13.31	60.93	7.15
			4.30	*13.40*	*57.70*	*8.00*
18659	8.54	6.11	4.65	15.31	57.32	8.07
			3.50	*14.26*	*55.18*	*8.80*
18660	9.95	5.28	4.50	16.13	60.81	3.33
			4.20	*14.96*	*60.10*	*4.92*
18692	10.74	5.58	5.17	16.63	54.28	7.60
18878	10.49	6.20	4.91	13.25	58.05	7.10
			4.00	*14.15*	*55.00*	*9.00*
18989	9.27	3.86	5.67	17.94	60.17	3.09
18872	10.25	8.40	5.45	10.06	57.04	8.80
			4.00	*10.00*	*53.00*	*12.00*
18698	9.77	8.13	5.73	11.38	53.94	11.05
18694	11.69	8.45	5.21	10.63	52.84	11.18
18665	8.68	9.15	5.05	10.88	54.24	12.00
18570	7.04	9.66	5.93	12.44	53.83	11.10
			5.00	*11.00*	*53.00*	*12.00*
18699	11.94	1.62	5.13	10.75	67.28	3.28
			4.00	*10.00*	*60.00*	*6.00*
18654	10.15	7.82	4.67	17.69	51.58	8.09
18705	11.51	5.98	5.04	17.56	52.09	7.82

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
18937	Wheat Bran	Clark & Tyler, Holly Springs
		Guarantee
18932	Wheat Middlings	Hightower Bros., Sardis
18964	Wheat Middlings	L. A. Latham & Son, Pontotoc
		Guarantee
	TENNESSEE FIBRE COMPANY, Memphis, Tenn.	
18687	Creamo Brand Feed Meal (Cow and Ox)	Union Naval Stores, Gulfport
		Guarantee
	TRENHOLM-KOLP COMPANY, Memphis, Tenn.	
18923	Wheat Bran	Merchants Groc. Co., Water Valley
		Guarantee
18598	Premium Alfalfa Mixed Feed	J. D. Ray, Rosedale
18922	Premium Alfalfa Mixed Feed	Merchants Groc. Co., Water Valley
		Guarantee
	UNION CITY GRAIN & FEED COMPANY, Union City, Tenn.	
*18976	Tennessee Horse Feed	Robertson & Co., Columbus
*19293	Tennessee Horse Feed	Robertson & Co., Columbus
†18980	Tennessee Horse Feed	J. H. Stevens & Son, Columbus
†19294	Tennessee Horse Feed	J. H. Stevens & Son, Columbus
		Guarantee
	VALIER & SPIES MILLING CO., St. Louis, Mo.	
18648	Valier's Bran	The Mississippi Co., Canton
18656	Valier's Bran	C. G. VanKewen, Durant
		Guarantee
18649	Valier's Middlings	The Mississippi Co., Canton
		Guarantee
	VALLEY MILLING COMPANY, St. Louis, Mo.	
18586	Delta Feed	A. B. Smith, & Co. Indianola
		Guarantee
	JOHN WADE & SONS, Memphis, Tenn.	
18610	Alfalfa Mixed Feed	J. F. Melton, Greenwood
18664	Alfalfa Mixed Feed	G. Lowenberg & Co., Kosciusko
18926	Alfalfa Mixed Feed	F. S. Leavell, Oxford
		Guarantee

* Nos. 18976 and 19293 were drawn from the same shipment.
† Nos. 18980 and 19294 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18937	8.82	5.71	4.58	17.75	55.97	7.17
			3.50	*14.00*	*54.00*	*10.00*
18932	8.90	4.32	4.39	16.31	61.16	4.92
18964	10.83	4.03	4.76	17.63	57.90	4.85
			5.00	*16.00*	*40.00*	*7.00*
18687	9.16	5.10	5.07	22.50	37.63	20.54
			5.00	*20.00*	*36.00*	*25.00*
18923	10.25	5.42	4.84	15.56	55.92	8.01
			3.60	*14.00*	*52.00*	*9.50*
18598	10.68	3.82	4.02	12.06	61.95	7.47
18922	10.76	3.75	4.15	12.06	61.00	8.28
			3.55	*10.55*	*52.25*	*12.00*
18976	9.22	2.63	3.09	8.88	69.74	6.44
19293	7.73	3.01	3.38	9.13	68.28	8.47
18980	9.02	3.48	3.19	9.25	66.97	8.09
19294	8.10	2.44	4.15	9.38	69.93	6.00
			3.50	*10.00*	*55.00*	*12.00*
18648	9.20	6.54	4.79	15.94	54.66	8.87
18656	9.54	7.90	5.03	15.75	52.88	8.90
			3.50	*14.50*	*50.00*	*10.00*
18649	9.99	5.68	6.43	18.25	54.48	5.17
			5.00	*16.00*	*50.00*	*8.00*
18586	8.39	3.76	5.06	9.88	62.73	10.18
			4.25	*9.25*	*50.00*	*12.00*
18610	9.68	3.75	3.73	11.06	60.59	11.19
18664	9.72	3.99	3.54	11.19	59.66	11.90
18926	8.53	3.38	3.42	10.81	64.41	9.45
			3.50	*10.50*	*52.00*	*12.00*

TABLE II.—Analyses of Commercial Feeding Stuffs

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
18934	Wheat Bran	Farmers Warehouse Co., Sardis
18994	Wheat Bran	A. E. Dahlrymple & Son, Amory
		Guarantee
18611	Chops	J. F. Melton, Greenwood
18693	Chops	W. A. McDonald, Bay St. Louis
		Guarantee
18925	Wheat Shorts	F. S. Leavell, Oxford
18963	Wheat Shorts	C. M. Elder, New Albany
19002	Wheat Shorts	Carlisle & Taylor, Aberdeen
19004	Wheat Shorts	Bumpas & Lowe, Aberdeen
		Guarantee
18609	Purity Feed	J. F. Melton, Greenwood
*18931	Purity Feed	T. H. Moore, Charleston
*19285	Purity Feed	T. H. Moore, Charleston
†18933	Purity Feed	Farmers Warehouse Co., Sardis
†19286	Purity Feed	Farmers Warehouse Co., Sardis
18960	Purity Feed	M. L. Nance, Ripley
		Guarantee
‡18927	Syr Ration Horse Feed	Davis, Mize & Call, Oxford
‡19284	Syr Ration Horse Feed	Davis, Mize & Call, Oxford
		Guarantee
	WATERLOO MILLING CO., Waterloo, Ill.	
18951	Wheat Bran	Tupelo Grocery Co., Tupelo
		Guarantee
	WEBB & MAURY, Memphis, Tenn.	
18956	Riverside Dairy Feed	DaLee Bros., Tupelo
		Guarantee
18955	Wheat Shorts	DaLee Bros., Tupelo
18959	Wheat Shorts	A. G. Barnett, Ripley
		Guarantee
	YATES & DONELSON CO., Memphis, Tenn.	
18632	Wheat Bran mixed with Corn Bran	Yazoo Groc. Co., Yazoo City
		Guarantee
	G. ZIEBALD MILLING CO., Red Bud, Ill.	
18977	Wheat Shorts	Robertson & Co., Columbus
18981	Wheat Shorts	J. H Stevens & Son, Columbus
		Guarantee

* Nos. 18931 and 19285 were drawn from the same shipment.
† Nos. 18933 and 19286 were drawn from the same shipment.
‡ Nos. 18927 and 19284 were drawn from the same shipment.

Collected by State Chemist, Season 1910-1911.

Laboratory Number.	Moisture—Per Cent.	Ash—Per Cent.	Crude Fat—Per Cent.	Crude Protein—Per Cent.	Carbohydrates—Per Cent.	Crude Fiber—Per Cent.
18934	9.45	6.13	4.45	16.75	55.17	8.05
18994	8.90	5.73	4.26	15.63	57.35	8.13
			3.50	*10.00*	*50.00*	*12.00*
18611	10.80	7.34	4.28	9.13	66.80	1.65
18693	12.66	1.32	4.39	8.88	70.75	2.00
18925	8.77	4.65	4.88	17.38	59.02	5.30
18963	10.50	4.64	4.36	16.31	59.53	4.66
19002	9.31	4.10	4.90	16.81	59.44	5.44
19004	9.25	3.87	4.75	17.13	60.47	4.53
			3.50	*10.00*	*50.00*	*12.00*
18609	11.60	7.01	4.26	9.50	62.37	5.26
18931	8.85	3.31	3.49	9.38	69.67	5.30
19285	9.60	2.57	3.72	9.25	69.03	5.83
18933	9.90	2.83	3.71	9.13	69.26	5.17
19286	9.57	2.54	3.63	9.44	69.12	5.70
18960	8.82	2.48	4.31	9.56	69.52	5.31
			4.25	*9.25*	*65.00*	*5.50*
18927	13.14	4.53	2.41	10.50	61.47	7.95
19284	9.19	4.35	2.48	10.75	63.71	9.52
			3.50	*10.50*	*55.00*	*12.00*
18951	9.97	6.10	4.16	15.19	56.97	7.61
			4.00	*15.00*	*50.00*	*8.25*
18956	8.35	7.92	5.57	19.13	47.21	11.82
			4.00	*18.00*	*45.00*	*14.00*
18955	10.10	4.35	3.80	16.38	60.24	5.13
18959	9.24	4.65	6.09	17.19	57.68	5.15
			3.50	*10.00*	*50.00*	*12.00*
18632	9.92	5.43	4.84	14.38	57.93	7.50
			3.70	*13.25*	*57.15*	*10.00*
18977	9.24	3.90	5.76	17.81	58.97	4.32
18981	10.98	3.23	4.35	16.50	62.00	2.94
			4.00	*15.00*	*56.00*	*7.00*

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi.

BULLETIN No. 155.

RECENT COTTON EXPERIMENTS

AGRICULTURAL COLLEGE, MISSISSIPPI.

DECEMBER, 1911.

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RECENT COTTON EXPERIMENTS*

Introduction.—This bulletin is a report on experiments recently conducted with cotton at the four Mississippi Experiment Stations. These experiment stations are the Central Station at the A. and M. College, the McNeill Branch Station at McNeill, the Holly Springs Branch Station at Holly Springs, and the Delta Branch Station at Stoneville. Some of the experiments have been conducted along the same lines at each of the four stations, but the experiments at the different stations are reported separately in this bulletin.

Different soil conditions and, to some extent, different climatic conditions prevail at the different stations and while the bulletin as a whole should be of interest to all cotton growers of the state, they should pay particular attention to the results from the stations where conditions are most similar to their own. For instance, it would be very incorrect to assume that the negative results usually secured from the use of commercial fertilizers at the station at the A. and M. College will apply to all sections of the state. The report consists mainly of tables which speak for themselves and readers can draw their own conclusions as to the application of the results to their own conditions.

Other cotton experiments are in progress at the experiment stations but these are not yet sufficiently advanced for their results to be published.

* The issue of this bulletin has been delayed on account of the burning of the printing establishment. It should have been out about two months ago and the Experiment Station regrets the delay.

RESULTS FROM THE CENTRAL EXPERIMENT STATION.

By J. W. Fox, J. R. Ricks, and E. C. Ewing.

The cotton experiments reported here were variety tests, fertilizer experiments, topping experiments, and distance experiments. To aid the reader in understanding the results, the report of the weather at this station for 1910 and 1911 is also given.

Table 1---Temperature, 1910 and 1911.

Months.	1910.				1911.			
	Minimum.	Average Minimum.	Maximum.	Average Maximum.	Minimum.	Average Minimum.	Maximum.	Average Maximum.
January	15	34.8	70	57.6	7	40	78	60.8
February	13	33	70	56	20	45	82	64.7
March	30	48.9	92	77.6	28	45.6	89	71.2
April	31	48.5	88	76.9	38	52.4	87	70.4
May	43	51.7	92	85.8	43	59.9	100	86.9
June	56	63.2	95	87.3	64	68.9	104	90.4
July	62	68.3	95	89	57	68	97	88.1
August	62	67.5	96	92.6	62	68.8	98	89
September	53	62.9	98	90.7	64	66.2	100	92.2
October	26	53.9	94	81.1	34	53	97	78
November	29	41	75	65.2	17	37.3	84	63.4
December	20	33	72	51.9	24	38.7	75	58

Table 2---Rainfall, 1910 and 1911.

	Total Rainfall, Inches.		Number of Days on which rain fell.	
	1910.	1911.	1910.	1911.
January	4.07	5.47	6	10
February	3.80	3.75	9	8
March	.93	1.45	2	5
April	3.02	10.07	6	12
May	2.62	1.92	5	3
June	4.49	5.88	12	12
July	8.67	6.24	14	18
August	1.42	5.10	6	18
September	.85	.20	2	6
October	2.76	2.18	5	7
November	1.93	4.28	5	12
December	3.00	11.83	10	18
Total	37.56	58.37	82	129

Variety Test.

All varieties were planted April 24th and 25th and directly thereafter a heavy rain fell, which packed the soil. Cool weather followed and delayed germination for so long that a hard crust formed on the soil before many of the seeds sprouted. After this crust formed, very few of the young plants could break through. As a result, poor stands were secured of those varieties which were slowest to germinate. The stands of four varieties were so poor that it was thought best to replant them. The Cleveland's Cleveland, Station Cleveland, Sproull, and Columbia were accordingly replanted three weeks after the first planting. This replanting placed these varieties at a great disad- vantage as the replanted rows between the older rows never had a fair opportunity to develop. As these replanted varieties were later in maturing than the others, they were not picked with them at the first picking.

The relative way in which the varieties came up is indicated in a column in the table. It is noticeable that the varieties which germinated most poorly and had to be replanted are varieties with large seeds while those whose germination was best are small seeded varieties. Quick germination and a good stand are of considerable importance in growing early crops of cotton. In this experiment poor stands were made good in those varieties that did not have to be entirely replanted by replanting the skips with hoes.

Table 3---Variety Test, 1911.

Names of Varieties.	Per Acre, Weight Seed Cotton, 1st picking.	Per Acre, Weight Seed Cotton, 2nd picking.	Per Acre, Weight Seed Cotton, 3rd picking.	Per Acre, Total Weight Seed Cotton.	Percentage of Lint.	Per Acre, Total Weight of Lint.	Per Acre, Total Weight of Seed.	Length of Staple in Inches, N. O. classification.	Value of Lint per Pound Good Middling Grade, N. O., Dec. 9th.	Value of Lint per Acre.	Value of Seed per Acre at $18.00 per Ton.	Total Value of Lint and Seed per Acre.	Rank in Money Value.	Number of Bolls Required to Yield 1 lb. Seed Cotton.	Germination as indicated by character of stand observed May 6, 11 days after planting.	Plants each variety each plat 0.132 acre killed or affected by cot. wilt dis.
									cents.							
Lone Star	398	888	385	1671	38.1	637	1034	1 1-8	10 1-8	$64.49	$ 9.30	$73.79	7	45	Poor	11
Triumph from A.D.Mebane *a*	385	772	265	1422	39.0	555	867	1 1-16full	10	55.50	7.80	63.30	14	45	Fair	21
Triumph from Jas. Wade	590	840	340	1770	36.0	637	1133	1 1-16	9 13-16	62.50	10.21	72.71	8	48	Fair	19
Cleveland, from J. R. Cleveland *a x*	*x*	1218	348	1566	33.0	517	1049	1 full	9¾	50.40	9.44	59.84	18	51	Poor	4
Cleveland, from Experiment Station *x*	*x*	1124	298	1422	35.3	502	920	1 1-16	9 13-16	49.25	8.28	57.53	19	53	Poor	3
Cook from J. R. Cook *a*	635	968	363	1966	35.0	688	1278	7-8	9 11-16	66.65	11.50	78.15	4	63	Fair	8
Cook from Exper. Station	635	786	280	1701	38.0	646	1055	7-8	9 11-16	62.58	9.50	72.08	9	53	Fair	6
Trice	815	385	105	1305	31.4	410	895	1 1-16	9 13-16	40.23	8.05	48.28	21	70	Good	35
Rowden 116	715	1120	469	2304	32.6	751	1553	1 1-8	10 1-8	76.03	13.98	90.01	2	53	Good	11
Sproull *x*	*x*	742	522	1264	33.0	417	847	1 1-16full	10	41.70	7.42	49.12	20	40	Very poor	0
Broadwell's Double Jointed	838	627	166	1631	33.7	550	1081	7-8	9 11-16	53.28	9.73	63.01	15	92	Fair	12
King	940	507	166	1613	33.7	544	1069	7-8	9 11-16	52.70	9.62	62.32	16	91	Fair	24
Simpkins	987	433	105	1525	35.8	546	979	7-8	9 11-16	52.89	8.81	61.70	17	92	Good	26
Truitt's Ninety Day	902	643	219	1764	34.0	600	1164	1	9 11-16	58.12	10.48	68.60	10	82	Very Good	15
Money Maker	667	907	280	1854	36.8	682	1172	1 full	9¾	66.69	10.55	77.24	6	86	Very good	5
Rublee	701	809	234	1744	34.0	593	1151	1 1-16	9 13-16	58.19	10.36	68.55	11	67	Good	4
Covington-Toole	722	817	287	1826	37.7	688	1138	1 full	9¾	67.08	10.24	77.32	5	85	Very good	2
Dixie	306	1051	424	1781	32.3	575	1206	1 full	9¾	56.06	10.85	66.91	12	80	Very good	1
World's Wonder	640	870	234	1744	31.0	541	1203	1 1-16full	10	54.10	10.83	64.93	13	74	Fair	1
Columbia *x*	*x*	851	340	1191	31.0	369	822	1 5-16	20	73.80	7.40	81.20	3	64	Very poor	1
Sunflower	613	888	272	1773	28.7	510	1263	1 3-8	21	107.10	11.37	118.47	1	90	Poor	1

a Originator of the variety.

x As these varieties had to be replanted they were three weeks later than the others, and they were not picked when the others were first picked.

TYPE OF STALK OF DIFFERENT VARIETIES.

The following is a condensed description of the type of plant of each of the different varieties and of the character of the foliage.

Lone Star.—Plant medium sized and stocky, leaves large, foliage dense on rich land, bolls quite storm proof.

Triumph.—The type of plant is very similar to the above and the same description will apply here for all practical purposes.

Cleveland, or Cleveland Big Boll.—Plant large and vigorous, some plants of semi-cluster type, foliage medium to dense, bolls not storm proof.

Cook, or *Cook's Improved.*—Plant large and vigorous, foliage medium dense, cotton falls out of bolls badly.

Cook, from Experiment Station.—Plant smaller than the original variety, being of medium size and having been selected very closely to type, foliage medium dense, cotton falls out of bolls badly.

Trice.—Plant small to medium in size but grows rapidly early in the season. The variety is somewhat mixed, many plants of the semi-cluster type with short joints, fruits rapidly, foliage light, bolls quite storm proof.

Rowden 116.—Plant large and vigorous, foliage medium dense, bolls quite storm proof, distinct from original variety called Rowden.

Sproull.—Plant medium sized and very stocky, leaves very large, foliage dense, bolls storm proof.

Broadwell, or Broadwell's Double Jointed.—Plant small and slender, foliage light, cotton falls out of bolls.

King.—Broadwell identical, or practically identical, with King and above remarks describe this variety.

Simpkins.—Practically identical with King except more uniform, all of the plants being more nearly of one type.

Truitt's Ninety Day.—Very similar to King but plants of slightly larger size.

Money Maker.—Plants small, of the Peterkin type, foliage light, plants very uniform.

Rublee.—Plants usually of the semi-cluster type, rather tall and slender with short joints, foliage light, fairly storm proof.

Covington-Toole.—Plants small, of the Peterkin type, foliage light, plants very uniform.

Dixie.—Plants medium to large, similar to Peterkin type, foliage medium dense. This is the wilt resistant variety distributed by the U. S. Department of Agriculture.

World's Wonder.—Plants medium to large, usually of semi-cluster type, foliage medium dense.

Columbia.—Plants medium sized and stocky, foliage dense, bolls storm proof.

Sunflower.—Plants tall and slender, foliage medium dense.

The following is a list of the names of parties from whom seed of the varieties grown at the College Station were obtained and their addresses:

Lone Star—U. S. Department of Agriculture, Washington, D.C.
Mebane's Triumph—A. D. Mebane, Lockhart, Tex.
Wade's Triumph—Jas. A. Wade, Alexander City, Ala.
Cleveland's Cleveland—J. R. Cleveland, Decatur, Miss.
Station Cleveland.—Mississippi Experiment Station.
Cook's Cook—J. R. Cook, Ellaville, Ga.
Station Cook—Mississippi Experiment Station.
Trice—West Tenn. Experiment Station, Jackson, Tenn.
Rowden 116—A. M. Ferguson & Co., Sherman, Tex.
Sproull—G. F. Sproull, Raines, Tenn.
Broadwell—John B. Broadwell, Alpharetta, Ga.
King—Otto Schwill and Co., Memphis, Tenn.
Simpkins—W. A. Simpkins, Raleigh, N. C.
Truitt's Ninety Day—J. G. Truitt, LaGrange, Ga.
Money Maker—Alexander Seed Co., Augusta, Ga.
Rublee—C. A. Rublee, Seagoville, Tex.
Covington-Toole—W. F. Covington, Headland, Ala.
Dixie—U. S. Department of Agriculture, Washington, D.C.
World's Wonder—J. E. Evans, Muldon, Miss.
Columbia—U. S. Department of Agriculture, Washington, D. C.
Sunflower—Marx Schaefer, Yazoo City, Miss.

Table 4---Variety Test, 1910.

Name of Varieties.	Weight seed cotton per acre, 1st picking, in lbs.	Weight seed cotton per acre, 2d picking, in lbs.	Weight seed cotton per acre, 3rd picking, in lbs.	Total yield seed cotton per acre in pounds.	Percentage of lint.	Total weight lint per acre in pounds.	Total weight of seed per acre in pounds.	Length of Staple.	Value of lint per pound.	Value of lint per acre.	Value of seed per acre, at $25.00 per ton.	Total value per acre.	Rank in money value.	No. bolls required to yield 1 lb. of cotton.
								inches	cts.					
Cook's Improved No. 9	924	1093	88	2105	38	800	1305	7-8	14	$ 112.00	$16.31	$ 128.31	1	56
Cook's Improved No. 8	520	1401	95	2016	40	806	1210	¾	14	112.84	15.02	127.86	2	57
Cook's Improved, from J. R. Cook	652	1181	205	2039	38.5	784	1254	¾	14	109.76	15.68	125.44	3	61
Triumph, from A. D. Mebane	469	1173	169	1811	40	724	1087	1 1-16	15	108.60	13.59	122.19	4	46
Covington-Toole	763	1019	66	1848	39.5	730	1118	1	14¾	107.67	13.97	121.64	5	85
Cook's Improved No. 11	653	1181	102	1936	39	755	1181	¾	14	105.10	14.76	119.86	6	59
Cook's Improved No. 7	594	1188	102	1884	38.5	725	1159	¾	14	101.50	14.49	115.99	7	62
Triumph, from Jas. Wade	513	1269	102	1884	35	659	1225	1 1-16	15	98.85	15.31	114.16	8	47
Cleveland No. 2	550	1269	58	1877	35	657	1220	1	14¾	96.91	15.25	112.16	9	53
Cleveland No. 1	623	1152	73	1848	35	647	1201	1	14¾	95.63	15.01	110.64	10	52
Wall's Early Prolific	697	1027	168	1892	33.7	638	1254	1	14¾	94.10	15.68	109.78	11	72
Triumph from Excelsior Seed Farm	484	1115	190	1789	35	626	1163	1 1-16	15	93.90	14.54	108.44	12	55
Allen Long Staple	521	784	88	1393	26.3	366	1027	1 3-8	25	91.50	12.84	104.34	13	86
Cleveland No. 3	499	1151	80	1730	35	605	1125	1	14¾	89.24	14.06	103.30	14	51
Excelsior	572	990	110	1672	37	619	1053	7-8	14	86.66	13.16	99.82	15	79
Sugar Loaf	1085	513	37	1635	35.7	584	1051	7-8	14	81.76	13.14	94.90	16	99
Simpkins	1019	550	59	1628	35.6	580	1048	7-8	14	81.20	13.10	94.30	17	86
Uncle Sam	733	660	66	1459	36.5	532	927	1	14¾	78.47	11.59	90.06	18	49
Reimproved King	902	528	37	1467	36.7	538	929	¾	14	75.32	11.61	86.93	19	90
Gold Coin	433	960	103	1496	35.4	530	966	7-8	14	74.20	11.97	86.17	20	77
Mexican Big Boll	528	799	88	1415	34.5	488	927	1	14¾	71.98	11.59	83.57	21	50

RESULTS WITH FERTILIZERS.

Table 5---Fertilizer Tests---Five Years.

Plot No.	Fertilizer per Acre.	Yield Seed Cotton, 1907.	Yield Seed Cotton, 1908.	Yield Seed Cotton, 1909.	Yield Seed Cotton, 1910.	Yield Seed Cotton, 1911.	Average Total Yield of Seed Cot.	Seed Cotton Percentage of Lint.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
1	Kainit, 288 lbs.	1468	1940	1744	1352	904	1481	38%
2	Acid Phosphate, 288 lbs.	1540	1688	1352	1656	1120	1471	38%
3	C.-S. Meal, 288 lbs.	1268	1376	832	1232	1016	1145	38%
4	No treatment	1280	1384	1240	1192	936	1206	38%
5	Manure, 4 tons, Lime, 800 lbs.	1528	2432	1744	1528	1496	1746	38%
6	C.-S. Meal, 288 lbs., Kainit, 288 lbs.	1664	1912	1616	1536	984	1342	38%
7	C.-S. Meal, 288 lbs., Kainit, 288 lbs., Acid Phosphate, 288 lbs.	1760	1872	1592	1464	1064	1550	38%
8	Manure, 8 tons	1736	2352	2440	1856	2152	2107	38%
9	Manure, 4 tons, Acid Phosphate, 288 lbs.	1616	2032	1792	1592	1888	1784	38%
10	Manure, 4 tons Kainit, 288 lbs.	1440	2096	1680	1496	1536	1649	38%
11	Kainit, 288 lbs. Acid Phosphate, 288 lbs.	1296	1680	1624	1264	864	1346	38%
12	C.-S. Meal, 288 lbs., Acid Phosphate, 288 lbs.	1040	1382	1040	1048	1000	1102	38%

Table 6---Relative Earliness from Fertilizer Plots as Shown by the Different Pickings, 1911.

Plot No.	Fertilizer per Plot.	1st picking, lbs. seed cotton per acre.	2nd picking., lbs. seed cotton per acre.	3rd picking, lbs. seed cotton per acre.	4th picking, lbs. seed cotton per acre.	Total Yield, lbs. seed cotton per acre.
1	Kainit, 288 lbs.	210	328	320	56	904
2	Acid Phosphate, 288 lbs.	352	336	360	72	1120
3	C.-S. Meal, 288 lbs.	192	312	416	96	1016
4	No treatment	184	248	408	96	936
5	Manure, 4 tons, Lime, 800 lbs.	336	456	608	96	1496
6	C.-S. Meal, 288 lbs., Kainit, 288 lbs.	256	384	288	56	984
7	C.-S. Meal, 288 lbs., Kainit, 288 lbs., Acid Phosphate, 288 lbs.	280	424	312	48	1064
8	Manure, 8 tons	608	760	688	96	2152
9	Manure, 4 tons, Acid Phosphate, 288 lbs.	584	696	512	96	1888
10	Manure, 4 tons, Kainit, 288 lbs.	416	608	400	112	1536
11	Kainit, 288 lbs., Acid Phosphate, 288 lbs.	328	328	168	40	864
12	C.-S. Meal, 288 lbs. Acid Phosphate, 288 lbs.	512	296	184	8	1000

Table 7---Manure and Kainit to Prevent Rust, 1911.

Plot.	1st picking, lbs. seed cotton per acre.	2nd picking, lbs. seed cotton per acre.	3rd picking, lbs. seed cotton per acre.	4th picking, lbs. seed cotton per acre.	Total Yield, lbs. seed cotton per acre.
Manure, 10 tons per acre	693	1026	458	90	2267
Kainit, 400 lbs. per acre	403	845	377	90	1715
No treatment	661	539	200	74	1474

Results from Kainit in 1910.

Plot.	1st Picking, lbs. seed cotton per acre.	2nd Picking lbs. seed cotton per acre.	Total Yield, lbs. seed cotton per acre.
Kainit, 200 lbs. per acre	722	1266	1989
No treatment	1178	722	1900

The application of from 200 to 400 pounds of potash to land on which cotton rusts badly is usually profitable as indicated in the first part of table 7. We do not get profitable results from potash used here on soils where cotton does not rust. This was true of the plots represented in the second part of table 7.

Table 8---Topping Cotton.

Results in 1911.

Plot.	1st picking lbs. seed cotton per acre.	2nd picking lbs. seed cotton per acre.	3rd picking lbs. seed cotton per acre.	Total Yield lbs. seed cotton per acre.
Topped July 15th	995	825	181	1931
Topped August 1st	675	919	194	1788
Not topped	744	850	162	1756

Results in 1910.

Plot.	1st picking lbs. seed cotton per acre.	2nd picking lbs. seed cotton per acre.		Total Yield lbs. seed cotton per acre.
Topped July 23rd	1479	187		1666
Topped August 5th	1567	185		1752
Not topped	1593	228		1821

Results in 1909.

Plot.	1st picking lbs. seed cotton per acre.	2nd picking lbs. seed cotton per acre.	3rd picking lbs. seed cotton per acre.	Total Yield lbs. seed cotton per acre.
Topped August 1st	888	316	376	1580
Not topped	792	256	416	1464

Results in 1907.

Plot.	Yield per acre seed cotton.
Topped August 3rd	1808 lbs.
Not topped	1575 lbs.
Topped August 26th	1780 lbs.
Not topped	1821 lbs.

DISTANCE EXPERIMENTS.

Table 9---Width of Rows.

Results in 1911.

Plot.	Average height of stalks.	1st picking lbs. seed cotton per acre.	2nd picking lbs. seed cotton per acre.	Total yield lbs. seed cotton per acre.
5 ft. rows	4½ ft.	922	309	1231
4½ ft. rows *a*	4½ ft.	907	439	1346
4 ft. rows *a*	4½ ft.	911	413	1324
3½ ft. rows	4½ ft.	1063	425	1488
3 ft. rows	4½ ft.	1100	526	1626

a The 4 and 4½ ft. row plots were slightly damaged by wilt.

Results in 1909 and 1910.

Plot.	Yield of seed cotton per acre. 1909.	Yield of seed cotton per acre. 1910.
6 ft. rows	1930 lbs.	1661 lbs.
5 ft. rows	2049 lbs.	2087 lbs.
4 ft. rows	2175 lbs.	

In the above the plants stood at an average of fifteen inches in the drill.

Table 10---Distances in the Drill for 1910 and 1911.

Plot.	1910.			1911.			
	1st picking, lbs. seed cot. per acre.	2nd picking, lbs. seed cot. per acre.	Total Yield seed cotton, lbs. per acre.	1st picking, lbs. seed cot. per acre.	2nd picking, lbs. seed cot. per acre.	3rd picking, lbs. seed cot. per acre.	Total Yield, lbs. seed cot. per acre.
12 inches	1796	566	2362	812	583	73	1468
20 inches	1454	621	2075	771	581	62	1414
30 inches	1202	666	1868	698	554	48	1300

In the above the rows were three feet and eight inches apart.

Table 11---Results from Poisoning for Cotton Army Worm.

Plot.	Dates of the poisoning.	1st picking lbs. seed cotton per acre.	2nd picking lbs. seed cotton per acre.	Total Yield lbs. seed cotton per acre.
Poisoned	1. Aug. 20. 2. Aug. 30.	644	770	1414
Not poisoned		531	236	767

The above results show that it is good practice to control the army worm by poisoning. Our results this season indicate that Paris green is more effective for this purpose than arsenate of lead. One pound of the former will be sufficient for one acre for each application. It will require from 4 to 5 pounds of the latter.

RESULTS FROM THE McNEILL EXPERIMENT STATION.

By E. B. Ferris.

NATURAL CONDITIONS AT McNEILL.

When this station was first located at McNeill the country was new; little cotton had been grown in the immediate vicinity and few of the fungous diseases common to the plant were here. For the first few years yields of cotton were fairly good, but, later, anthracnose, or pink boll rot, became very troublesome and sometimes apparently reduced the yield of cotton fully 50 per cent. The heavy summer rainfall here contributed greatly to the spread of this trouble as well as to any trouble of like character, and this with the natural tendency of the plant to shed its forms on account of daily rains, made cotton growing here rather unsatisfactory even before the appearance of the boll weevil, and with this pest the frequent showers of June, July, August and September will make the growing of cotton almost an economic impossibility so long as the weevils remain as plentiful as they have been for the past two years.

The rainfall in this section of the state, so near the Gulf Coast, is said to be the heaviest of that in any portion of the United States except a strip along the coast of Northwest Washington. And it is not altogether the total rainfall here that counts for so much in the control of the weevil and fungous diseases, as it is the frequency of the showers, many of these amounting to almost nothing in inches, but coming almost daily, contribute to the reproduction of the weevil and the spread of fungous growths of every kind.

This station has kept daily weather records since it was established and the following table gives a summary of weather conditions since 1905:

Table 12---Weather Report; Temperature and Rainfall.

Year.	January			February			March			April			May			June			July			August			Sept.			October			Nov.			Dec.			Total Rainfall.
	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	
1905		16	7.77		13	8.43		40	9.67	93	38	11.59		57	6.36	98	64	5.55	97	63	8.50	94	67	5.54	93	59	3.34	86	39	8.03	79	36	3.44	69	25	7.25	85.47
1906	75	25	3.46	70	29	4.51	79	28	10.57		38	1.96	94	45	3.02	99	64	5.47	95	68	5.80	100	68	3.83	95	65	.....	85	38	.78	84	27	1.19	80	26	2.38	53.20
1907	80	28	1.16	78	30	6.35	90	41	1.22	85	30	6.99	91	49	10.86	95	54	2.71	98	68	6.11	97	66	10.48	96	60	6.06	90	38	1.32	81	28	6.61	74	27	6.65	66.52
1908	76	25	6.05	75	27	4.92	90	38	3.00	89	48	3.98	94	39	8.76	95	61	7.87	96	66	12.32	96	64	7.47	95	48	9.41	84	36	.46	82	30	1.15	80	28	1.19	66.58
1909	78	23	2.48	78	23	5.91	84	34	6.50	87	39	6.25	88	45	12.20	97	66	10.48	97	61	8.74	103	69	7.43	95	47	8.49	94	39	3.76	84	31	1.01	75	20	7.90	81.15
1910	74	22	2.81	75	23	5.13	88	30	.97	87	36	.42	94	54	4.57	94	60	10.09	96	66	10.76	97	70	3.06	96	56	3.11	96	30	4.17	82	32	1.87	72	23	2.12	49.08
1911	81	15	4.20	80	25	2.32	90	37	5.51	85	47	11.08	98	53	2.91	99	67	5.96	93	62	8.94	97	68	6.57	98	68	8.14	93	39	4.18	81	23	3.38	74	26	6.08	69.27

VARIETY TEST.

In January, 1911, 2.4 acres of land were selected for conducting tests with varieties of cotton. About half of this land had grown cotton the year before, while the other half had grown corn and velvet beans. The half heretofore planted to cotton was naturally much more productive soil than the half previosuly planted to corn and velvet beans, but was more on the order of bottom land and not so perfectly drained. All this land was laid off in rows four and one-half feet apart in January and bedded. In March it was fertilized with a mixture of acid phosphate and sulphate of ammonia at the rate of 400 pounds of acid phosphate and 66 pounds of sulphate of ammonia per acre and rebedded. These beds were dragged down almost level about the first of April and twenty varieties of cotton were planted April 6th, each variety occupying a single row and this being repeated as often as was necessary to plant all the land. This was done to avoid as nearly as possible variations in yield due to inequalities of the soil, for while the more level and lower portion of the patch was naturally the better land, experience showed that the upper and more rolling half made much the better cotton.

There were seventy-two rows in the field, so that there were four rows each of the first ten varieties given below and three rows each of the others, each row being one-thirtieth of an acre. The variety, Ashcraft's Double Jointed Snow Bank, came after the other varieties were planted and was given two rows on the opposite side of the field from where the planting was started.

With the exception of the Sproull cotton these varieties all came up to almost perfect stands, but on the lower half of the field, where cotton had grown the year before, a great deal of the young cotton died. The cotton died in spots and was evidently caused by disease germs which were present in the soil from the previous year, as no such trouble manifested itself on the land where corn had grown the year before. In reporting results we give the calculated yields as gathered and the calculated yields figured on the basis of a perfect stand.

Experience with this patch of cotton showed that the rows were too wide for best results and that larger yields would probably have been made with narrower rows, as the cotton never grew large enough, except on the bottom land, to reach near the center of such rows. The cotton was thinned to about twenty-four inches in the drill and we noted few if any more grown bolls on the stalks having, on account of a poorer stand, a greater distance than this in the drill.

When this cotton was about ready to put on squares, which was the latter part of May, we began going over it from once to twice a week catching boll weevils and this was continued for almost a month. Then there were so many forms that the process of looking into each square to find the weevils was too laborious and the method of catching the grown weevils gave place to the process of picking up squares. We were only able to pick up these squares about twice, after which daily rains interfered, sometimes washing the fallen squares entirely away and again leaving the freshly plowed land too soft to hold up the laborers who did the picking. In all 145 grown weevils were caught from this patch of cotton and several hundred squares picked up. After the continuous spell of wet weather, we were never able to regain control of the weevils and had to let them run their course.

A great many bolls were set on this cotton and at the first picking it looked as if three-fourths of a crop would be made in spite of the weevil and adverse weather conditions, but a great many bolls more than half grown were later punctured and failed to open at all.

In the table following the yield of cotton calculated in pounds per acre as given for each picking, also the total yield, and the total yield calculated on the basis of a perfect stand, the stalks having been counted on each row and the percentage of stand determined:

Table 13---Variety Test, 1911.

No.	Names of Varieties.	Fraction of Acre in test.	Pounds of seed cotton per acre, Aug. 22, calculated.	Pounds of seed cotton per acre, Sept. 15, calculated.	Total actual yield per acre, calculated.	Yield seed cotton per acre, based on perfect stand, calculated.
1	Lone Star	4-30	263	150	420	524
2	Triumph from Mebane	4-30	296	150	446	518
3	Triumph from Wade	4-30	262	154	416	526
4	Cleveland Big Boll	4-30	307	169	476	580
5	Cook's Improved, from Cook	4-30	240	210	450	522
6	Cook's Improved, from Station	4-30	172	154	326	466
7	Trice	4-30	435	128	563	770
8	Rowden 116	4-30	188	128	316	464
9	Sproull	4-30	101	128	229	434
10	Broadwell's Double Jointed	4-30	405	105	510	662
11	King	3-30	385	95	480	584
12	Truitt's 90-day	3-30	380	150	530	588
13	Money-Maker	3-30	240	140	300	432
14	Rublee	3-30	240	135	375	422
15	Covington-Toole	3-30	170	160	330	358
16	Dixie	3-30	245	150	395	452
17	World's Wonder	3-30	350	120	470	504
18	Columbia	3-30	240	125	365	650
19	Sunflower	3-30	270	115	385	388
20	Barber's Big Boll Prolific	3-30	270	105	375	478
21	Ashcraft's Double Jointed Snow Bank	2-30	375	250	625	625

SIX YEARS WORK WITH FERTILIZERS UNDER COTTON AT THE McNEILL BRANCH EXPERIMENT STATION.

In 1905 sixty plats of land of one-twentieth acre each were set aside for permanent work with fertilizers for cotton and corn. These plats are located on soil as nearly uniform in composition as possible, practically level, and typical of the vast body of pine lands in South Mississippi. Thirty plats each are planted yearly to corn and cotton, one crop succeeding the other, with cowpeas grown in the corn to keep up the productiveness of the soil. These plats have been fertilized the same way each year since the experiment began, but only ten kinds and combinations of fertilizer have been used, the tests with each crop having been conducted in triplicate and the plats which were fertilized alike having been so distributed over the field as to do away of nearly as possible with variations in yield due to inequalities of the soil.

At the same time fertilizer work has been carried on with corn and cotton on eight plats of one-twentieth acre each located on what

we term the parked area. This parked area is the land on which cattle were fed during the winter of 1902-'03.

At that time thirty head of steers were fed here for about one hundred days on cottonseed meal and hulls, the troughs having been regularly moved during the feeding period so as to cause a uniform distribution of the manure from these cattle and the land having been plowed at intervals so as to prevent its washing away over the surface. The eight test plats set aside for this work with corn and cotton were selected in the center of this five-acre tract as representative of the whole.

The boll weevil appeared in September, 1909, and during the years 1910 and 1911 seriously affected the cotton as will be seen from the table following in which is given the results of all this work calculated to the basis of one acre.

Table 14---Fertilizer Experiments.

Plot No.	Kind and Quantity of Fertilizer	Yield of Seed Cotton Calculated in Pounds per Acre.						
		1906	1907	1908	1909	1910	1911	Aver.
1	No Fertilizer	480	220	110	153	20	30	169
2	100 lbs. Cottonseed Meal	760	436	376	400	90	63	354
3	100 lbs. Acid Phosphate	800	514	744	480	366	166	512
4	100 lbs. Kainit	620	300	274	186	34	8	237
5	100 lbs. Cottonseed Meal, 100 lbs. Acid Phosphate	1060	616	644	513	326	292	575
6	100 lbs. Cottonseed Meal, 100 lbs. Acid Phosphate, 100 lbs. Kainit	860	640	693	520	306	300	553
7	200 lbs. Cottonseed Meal, 100 lbs. Acid Phosphate	1040	756	684	620	306	370	630
8	100 lbs. Cottonseed Meal, 200 lbs. Acid Phosphate	1000	666	636	480	254	340	563
9	100 lbs. Cottonseed Meal, 500 lbs. New Jersey Marl	620	420		360		140	385
10	100 lbs. Cottonseed Meal, 100 lbs. Ground Phosphate Rock	840	510		520		220	522
11	165 lbs. Raw Ground Bone			720				
12	100 lbs. Cottonseed Meal, 400 lbs. Lime and Acid Phos. Mixture, (Reverted P_2O_5)			680		406		
13	100 lbs. Cottonseed Meal, 100 lbs. Acid Phosphate, On land parked by cattle, winter 1902-'03	1540	1120	920	624	180	490	812
14	100 lbs. Cottonseed Meal, 100 lbs. Acid Phosphate, 100 lbs. Kainit, On land parked by cattle, winter 1902-'03	1485	1090	870	633	170	510	793

In 1911 all fertilizer applications given in table were doubled.

Time of Planting Cotton.

Earliness in maturity has much to do with the success or failure of growing cotton under boll weevil conditions and to find how much this earliness of maturity is influenced by the time of planting, an experiment was conducted here in 1911 of planting four lots of cotton at intervals of two weeks, treating all alike as nearly as possible, and

keeping records of yield from the several plantings. Four plats of land of one-tenth acre each were selected for this work. This land was of uniform composition, of the best quality, and had been thoroughly prepared and fertilized. Triumph cotton seed were used in the test and were planted at intervals of two weeks from April 1st until the four plats were planted. The seed on all these plats germinated perfectly and gave perfect stands, but cold nights injured the stand of the cotton planted April 1st to a certain extent, though not materially. Weevils were caught from May 20th to June 20th and after this, fallen squares were picked up about twice, when daily rains made it impossible to continue the work.

The yields calculated in pounds of seed cotton per acre were as follows:

Planted April 1st, 278 pounds; planted April 15th, 289 pounds; planted May 1st, 55 pounds; planted May 15th, 0 pounds.

RESULTS FROM THE HOLLY SPRINGS BRANCH EXPERIMENT STATION.

By C. T. Ames.

Table 15---Variety Test, 1911.

Plot No.	Names of Varieties.	Weights of Pickings by Plats—Seed Cotton.				Total Yield Seed Cotton per Acre.	Percentage of Lint.	Yield of Lint per Acre.	Length of Staple in inches.
		Sept. 22.	Oct.3-20	Nov. 7.	Nov. 18.				
		lbs.	lbs.	lbs.	lbs.	lbs.			
1	Lone Star	30	49	32	6	1170	37%	433	1 1-16
2	Triumph, from Mebane	44	54	39	5	1420	40%	570	1 1-16
3	Triumph, from Wade	51	59	35	7	1520	35%	530	1 1-16
4	Cleveland Big Boll	52	75	36	6	1690	32%	540	1
5	Cook, from Cook	36	56	32	7.5	1315	36%	475	7-8
6	Cook, from Station	29	60	32	6	1270	39%	495	¾
7	Trice	104	58	25	5	1920	29%	555	1
8	Rowden 116	61	67	31	6.5	1655	35%	575	1 1-16
9	Sproull	27	73	36	8	1440	33%	475	1 1-16
10	Broadwell's Double Jointed	78	56	24	5	1630	36%	585	¾
11	King	78	51	20	5	1540	35%	540	¾
12	Simpkins	80	45	20	5.5	1505	35%	525	¾
13	Truitt's Ninety Day	77	61	30	5	1730	34%	590	7-8
14	Money Maker	34	71	40	8	1530	37%	565	7-8
15	Rublee	56	62	29	7	1540	35%	540	7-8
16	Covington-Toole	31	68	37	9	1450	39%	565	7-8
17	Dixie	29	72	39	12	1520	32%	485	7-8
18	World's Wonder	41	63	30	7	1410	33%	465	1 1-16
19	Columbia	36	66	29	4.5	1355	33%	445	1¼
20	Sunflower	43	48	20	5	1160	31%	360	1 3-8

These plats were planted May 3, 1911 in four and one-half foot rows on valley soil. One row of each variety was planted in the order indicated above and each variety was repeated five times in the same order. The above results were influenced to some extent by the cotton wilt disease. Some varieties were affected by the disease more than others and the variety, Cleveland Big Boll, appeared to be the most resistant.

Plat No.	200 lbs. Fertilizer per Acre.	Weights of Pickings. Sept. 21. lbs.	Oct. 3. lbs.	Oct. 27. lbs.	Nov. 17. lbs.	Total lbs.	Seed cotton per acre, lbs.	Plat No.	400 lbs. Fertilizer per Acre.	Weights of Pickings. Sept. 21. lbs.	Oct. 3. lbs.	Oct. 27. lbs.	Nov. 17. lbs.	Total lbs.	Seed cotton per acre, lbs.
1	No Fertilizer	8	6	5	1	20	400								
2	200 lbs. Cottonseed Meal	25	15	9	0.5	44.5	885								
3	200 lbs. Acid Phosphate	37	9	4	1	51	1020								
4	200 lbs. Kainit	15	8	6	1	30	600								
5	No Fertilizer	10	8	5	1	24	480								
6	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	33	10	6	0.5	49.5	985	6½	200 lbs. Cottonseed Meal, 200 lbs. Acid Phosphate	43	15	4	0.5	62.5	1245
7	100 lbs. Cottonseed Meal.. 100 lbs. Kainit	21	9	7	1	38	760	7½	200 lbs. Cottonseed Meal, 200 lbs. Kainit	22	17	10	1	50	1000
8	100 lbs. Acid Phosphate, 100 lbs. Kainit	26	11	5	0.5	42.5	845	8½	200 lbs. Acid Phosphate, 200 lbs. Kainit	33	11	3	0.5	47.5	945
9	120 lbs. Acid Phosphate, 40 lbs. Cottonseed Meal, 40 lbs. Kainit	23	5	5	1	34	680	9½	240 lbs. Acid Phosphate, 80 lbs. Cottonseed Meal, 80 lbs. Kainit	35	12	4	0.5	51.5	1025
10	No Fertilizer	5	12	6	2	25	500	10½	No Fertilizer	5	5	5	2	17	340
11	150 lbs. Cottonseed Meal, 50 lbs. Acid Phosphate	20	9	6	1	36	720	11½	300 lbs. Cottonseed Meal, 100 lbs. Acid Phosphate	23	20	6	1	50	1000
12	100 lbs. Cottonseed Meal, 100 lbs. Acid Phosphate	24	9	4	1	38	760	12½	200 lbs. Cottonseed Meal, 200 lbs. Acid Phosphate	25	18	7	1.5	51.5	1030
13	50 lbs. Cottonseed Meal, 150 lbs. Acid Phosphate	16	9	5	1	31	620	13½	100 lbs. Cottonseed Meal, 300 lbs. Acid Phosphate	30	9	3	0.5	42.5	850
14	No Fertilizer	8	6	5	1	20	400	14½	No Fertilizer	4	8	4	1	17	340

Variety Cleveland Big Boll, planted May 4, 1911. Plats 1-20 acre each. Soil rolling hill land.

Table 17---Six Years' Results from Fertilizers Under Cotton.

Plat No.	200 lbs. Fertilizer per Acre.	Yield of Seed Cotton per Acre.						Average for six years.	Grade in inches per 1000 feet.
		1906	1907	1908	1909	1910	1911		
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	No Fertilizer	520	860	820	310	300	400	535	7.8
2	200 lbs. C.-S. Meal	680	1140	1240	615	900	885	910	6.5
3	200 lbs. Acid Phos.	1180	1200	1420	690	1060	1020	1095	4.3
4	200 lbs. Kainit	520	940	890	460	470	600	647	5.4
5	No Fertilizer	560	860	790	365	290	480	557	5.4
6	100 lbs. C.-S. Meal, 100 lbs. Acid Phos.	980	1140	1240	615	1160	985	1020	1.1
7	100 lbs. C.-S. Meal, 100 lbs. Kainit	640	880	1000	550	800	760	772	1.1
8	100 lbs. Acid Phos. 100 lbs. Kainit	960	980	1100	625	910	845	903	5.4
9	120 lbs. Acid Phos., 40 lbs. C.-S. Meal, 40 lbs. Kainit	1040	1030	1230	670	800	680	908	12
10	No Fertilizer	600	760	820	340	250	500	545	15
11	150 lbs. C.-S. Meal, 50 lbs. Acid Phos.	940	900	1120	580	820	720	847	17
12	100 lbs. C.-S. Meal, 100 lbs. Acid Phos.	940	820	1190	630	810	760	858	17
13	50 lbs. C.-S. Meal, 150 lbs. Acid Phos.	800	1120	1210	660	800	620	868	20
14	No Fertilizer	660	690	910	330	340	400	555	17

Plat No.	400 lbs. Fertilizer per Acre.	Yield of Seed Cotton per Acre.						Average for six years.	Grade in inches per 1000 feet.
		1906	1907	1908	1909	1910	1911		
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1½	No Fertilizer	420	580	560	260			455	40
2½	400 lbs. C.-S. Meal	780	780	920	470			738	36
3½	400 lbs. Acid Phosphate	850	940	1070	425			821	37
4½	400 lbs. Kainit	420	780	790	400			598	38
5½	No Fertilizer	540	800	650	230			555	21
6½	200 lbs. C.-S. Meal, 200 lbs. Acid Phosphate	1120	1160	1540	910	1186	1245	1193	17
7½	200 lbs. C.-S. Meal, 200 lbs. Kainit	760	1080	1180	660	830	1000	918	14
8½	200 lbs. Acid Phosphate, 200 lbs. Kainit	1180	1200	1460	700	1030	945	1086	12
9½	240 lbs. Acid Phosphate, 80 lbs. C.-S. Meal, 80 lbs. Kainit	1218	1270	1570	840	1050	1025	1162	8.5
10½	No Fertilizer	520	850	920	250	200	340	513	3.4
11½	300 lbs. C.-S. Meal, 100 lbs. Acid Phosphate	1040	1170	1650	850	940	1000	1108	2.5
12½	200 lbs. C.-S. Meal, 200 lbs. Acid Phosphate	1040	1180	1680	830	1000	1030	1127	4.6
13½	100 lbs. C.-S. Meal, 300 lbs. Acid Phosphate	760	1060	1080	600	670	850	837	3.3
14½	No Fertilizer	700			430	450	340	480	1

Table 18---Fertilizer Test, 1911.

Plat No.	Fertilizer per Acre.	Weights of Pickings. Sept. 21.	Oct. 3.	Oct. 27.	Nov. 17.	Total.	Seed cotton per acre.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	No fertilizer	4	6	2	3.5	15.5	310
2	200 lbs. Cottonseed Meal	19	15	14	3	51	1020
3	200 lbs. Acid Phosphate	32	11	5	0.5	48.5	970
4	200 lbs. Kainit	7	10	6	1.5	24.5	490
5	No fertilizer	4	6	8	1	19	380
6	200 lbs. Raw Phosphate Rock	19	16	5	1	41	820
7	400 lbs. Raw Phosphate Rock	21	20	8	1	50	1000
8	200 lbs. Acid Phosphate	20	11	6	1	38	760
9	100 lbs. Cotton seed Meal 100 lbs. Acid Phosphate	24	13	6	1.5	44.5	890
10	100 lbs. Cottonseed Meal, 200 lbs. Raw Phosphate Rock	22	14	6	2	44	880
11	No fertilizer	8	1	6	3	28	560
12	100 lbs. Cottonseed Meal, 200 lbs. Acid Phosphate	22	10	5	1	38	760
13	200 lbs. Acid Phosphate	16	12	5	1	34	680
14	400 lbs. Raw Phosphate Rock	15	13	6	1	35	700
15	200 lbs. Kainit	12	16	7	1	36	720
16	No fertilizer	9	10	8	2	29	580
17	200 lbs. Raw Phosphate Rock	19	14	6	1	40	800
18	400 lbs. Raw Phosphate Rock	16	10	3	0.5	29.5	590

Variety, Cleveland Big Boll. Planted May 4, 1911. Plats six rows each, 4 feet wide and 92 feet long, making 1-20 acre each.

Table 19---A Test of Four Forms of Nitrogen.

Plat No.	Lbs. Fertilizer per Acre.	Weights of Pickings. Sept. 28.	Oct. 20.	Nov. 16.	Total.	Pounds of seed cotton per acre.	Plat No.	Lbs. Fertilizer per Acre.	Weights of Pickings. Sept. 28.	Oct. 20.	Nov. 16.	Total.	Pounds of seed cotton per acre.
		lbs.	lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	lbs.	lbs.	lbs.
1	200 lbs. Cotton seed Meal, 200 lbs. Acid Phosphate	36	12	2	50	1000	1½	No Fertilizer	16	12	7	41	820
2	200 lbs. Acid Phosphate, 80 lbs. Nitrate of Soda	27	12	3	42	840	2½	200 lbs. Cottonseed Meal, 200 lbs. Acid Phosphate	27	17	7	51	1020
3	No Fertilizer	13	10	3	26	520	3½	200 lbs. Acid Phosphate, 80 lbs. Nitrate of Soda	29	16	7	52	1040
4	200 lbs. Acid Phosphate, 150 lbs. Nitroline	20	13	3	36	720	4½	200 lbs. Acid Phosphate, 150 lbs. Nitroline	29	20	6	55	1100
5	200 lbs. Acid Phosphate, 486 lbs. Ammoline	20	10	3	33	660	5½	200 lbs. Acid Phosphate, 486 lbs. Ammoline	27	13	4	44	880

Plats 1-20 acre each. Soil rolling hill land. Variety of Cotton, Cook's Improved, planted in 4 foot rows on May 10, 1911.

Remarks.—The soil employed in making these fertilizer tests has been in cultivation for more than fifty years, and represents the characteristic poorer type of soils found in this section of the state.

Each plat has been used for the past six years with the same kind and quantity of fertilizers.

No manure of any kind has been used on this land, nor leguminous crop grown during the past six years, or probably at any time prior to that, except the fertilizer used in making the test.

It can be seen from the foregoing tables that nitrogen and available phosphorus are very deficient, and that an application of these elements is profitable.

RESULTS FROM DELTA BRANCH EXPERIMENT STATION.

By G. B. Walker.

Variety Test.

Below is given a list of the twenty-three varieties of cotton tested at the Delta Branch Experiment Station in 1911, with data which shows results obtained from each variety.

The land on which this test was made is a tract of 4 3-5 acres of characteristic Deer Creek sandy loam soil, being only fairly well surface drained, and not highly improved. It grew oats followed by Mexican June corn the year previous. No fertilizer was used.

The land was broken flat the first week in March, put into beds four feet apart in April, and planted on May 1st. One row of each variety was planted in the order in which they appear in the table, and in this order the varieties were repeated five times. The planting was done in this manner to obviate any differences there might be in the soil. There was 1-5 acre planted to each variety and our yields per acre are computed on that basis.

The cotton was planted just at the beginning of a long drought and as a result poor stands were secured of some of the varieties, particularly those varieties having large seed. The stand in no case, however, was so bad as to justify replanting.

This field of cotton was attacked by two broods of the cotton army worm, by the boll worm, and by the boll weevil, each of which did considerable damage to the crop.

Samples of lint cotton from each of the varieties were classed and priced by the Greenville Cotton Company, of Greenville, Miss., and the McGee-Dean Cotton Company of Leland, Miss., and our valuations are made from information furnished by these concerns. The Experiment Station is greatly indebted to the above mentioned for the assistance rendered by them.

Table 20---Variety Test, 1911.

Names of Varieties.	Date of first blooms.	Character of foliage.	Pounds seed cotton per acre, 1st pick., Sep. 30.	Pounds seed cotton per acre, 2nd pick., Nov. 2.	Total yield seed cotton per acre.	Yield lint cotton per acre.	Percentage of lint.	Length of staple according to Leland classification.	Character of lint.	Price of lint per pound middling grade.	Value of lint cotton per acre.	Value of seed per acre, at $18.00 per ton.	Total value of lint and seed per acre.	% of stand secured	Rank as to money value
			lbs.	lbs.	lbs.	lbs.	%	inches.		cts.				%	
Rublee	Jun 27	Very light	1235	275	1510	498	33	1	Good, strong, even	9¾	$48.55	$9.10	$57.65	95	3
Broadwell's Double Jointed	Jun 28	Very light	1125	225	1350	445	33	5-8	Very poor, uneven	8¼	31.71	8.14	44.85	98	20
Covington-Toole	July 2	Very light	915	395	1310	484	37	1	Fairly good, and even	9¾	47.16	7.43	54.62	98	8
Truitt's Ninety-Day	Jun 29	Very light	1255	275	1530	489	32	½ to 5-8	Poor and uneven	8¼	40.34	9.37	49.71	98	14
Sproull	July 2	Very d'nse	580	330	910	282	31	1	Fairly good and even	9¾	27.50	5.65	33.15	80	23
Trice	Jun 26	Light	1390	225	1615	484	30	7-8	Fairly good and even	9½	45.98	11.08	57.06	97	5
Simpkins	Jun 29	Very light	1290	165	1455	480	33	½ to5-8	Poor in every respect	8¼	39.60	8.77	48.37	98	17
King	Jun 26	Very light	1285	200	1485	519	35	½ to 5-8	Poor in every respect	8¼	42.82	8.60	51.42	98	12
World's Wonder	Jun 28	Light	1080	380	1460	438	30	1 1-16	Good, strong, even	10¼	44.89	9.20	54.09	95	10
Dixie	July 1	Light	925	470	1395	446	32	½	Poor, undesirable	8¼	37.79	8.54	45.33	97	19
Rowden 116	Jun 28	Medium	1040	350	1390	463	33½	1 1-16	Very good	10 1-8	46.88	8.34	55.22	92	7
Money Maker	July 2	Light	860	345	1205	445	37	7-8	Poor and undesirable	8½	37.82	6.84	44.66	95	21
Cook, from Exp. Station*a*	July 1	Dense	1115	380	1495	538	36	½	Undesirable, any tr'd.	8¼	44.38	8.61	52.99	95	11
Cook, from Cook	July 1	Dense	985	315	1300	455	35	¾	Wasty	8¾	39.81	7.60	47.41	95	18
Cleveland, from Exp. Sta.*a*	July 1	Dense	965	330	1295	430	34	7-8	Very wasty and unev.	9½	40.85	7.78	48.63	92	16
Cleveland, from Cleveland	July 2	Dense	980	385	1365	455	33½	1 1-16	Fairly good and even	10 1-8	46.07	8.10	54.17	90	9
Triumph, from Wade	Jun 29	Dense	995	340	1335	480	36	1 1-16full	Good, strong body	10 1-8	48.60	7.70	56.30	95	6
Triumph, from Mebane	Jun 28	Dense	985	360	1345	510	38	1 1-8	Very good and even	10¾	54.82	7.51	62.33	93	2
Lone Star	Jul 2	Dense	830	375	1205	420	35	1 1-8 full	Good heavy body and staple	12	50.40	7.06	57.46	90	4
Express	Jun 28	Very light	1475	220	1695	474	28	1 1-8 full	Even, ex. heavy body	12	56.88	10.98	67.86	98	1
Sunflower	Jun 29	Light	755	270	1025	256	25	1 5-16	Good, silky and str'ng	17	43.52	6.92	50.44	95	13
Columbia	Jun 29	Dense	725	325	1050	315	30	1¼	Good body, strong and even	13½	42.52	6.61	49.13	92	15
Mississippi Silk	July 2	Light	540	250	790	189	24	1 7-16	Good body and staple	19½	36.85	5.41	42.26	95	22

a From Experiment Station, A. and M. College, Agricultural College, Miss.

Spacing.

We tested at the Delta Station in 1911 3-foot, 3 1-2 foot, 4-foot, 5 foot, and 6 foot rows. In all rows the stalks stood from 18 to 24 inches in the drill. The best yield was gotten from the 3 1-2 foot rows, with the second best from the 3 foot rows, third from the 4 foot rows, fourth from the 5 foot rows, and fifth from the 6 foot rows.

AVAILABLE BULLETINS AND CIRCULARS.

The following bulletins and circulars of the Station may be had on request:

No. **Bulletins.**

60—Value of Cotton Seed to the Farmer.
84—Report of Field Work at College Station for 1903.
90—San Jose Scale.
91—Inspection and Analyses of Commercial Fertilizers.
92—Beef Cattle.
93—Peach and Plum Culture.
94—Report of Work at McNeill Branch Station for 1905.
95—The Dairy Cow.
104—Inspection and Analyses of Cotton-Seed Meal.
107—Pork Production at the Delta Station.
114—Inspection and Analyses of Cotton-Seed Meal.
119—Report of Work at the Delta Branch Station for 1907 and 1908.
121—Experiments in Feeding Beef Steers.
122—Report of Work at the Holly Springs Branch Station for 1908.
125—Inspection and Analyses of Commercial Feeding Stuffs.
127—Inspection and Analyses of Cotton-Seed Meal.
128—Inspection and Analyses of Cotton-Seed Meal.
129—Sugar Cane for Syrup Making.
132—The Soils of Mississippi.
133—Inspection and Analyses of Commercial Feeding Stuffs.
135—Cotton 1909.
137—Inspection and Analyses of Commercial Feeding Stuffs.
138—Inspection and Analyses of Commercial Feeding Stuffs.
139—The Boll Weevil in Mississippi, 1909.
140—Cotton Diseases in Mississippi.
141—Control of Diseases of Fruits, Flowers and Vegetables.
142—Inspection and Analyses of Commercial Fertilizers.
143—Inspection and Analyses of Cotton-Seed Meal.
144—Inspection and Analyses of Commercial Feeding Stuffs.
145—Inspection and Analyses of Commercial Feeding Stuffs.
146—Suggestions for Growing Home Fruits.
147—Apple Growing in Mississippi.
148—Inspection and Analyses of Cotton-Seed Meal.
149—Inspection and Analyses of Commercial Feeding Stuffs.
150—Inspection and Analyses of Commercial Fertilizers.
151—Inspection and Analyses of Cotton-Seed Meal.
152—Inspection and Analyses of Commercial Feeding Stuffs.
153—Inspection and Analyses of Commercial Feeding Stuffs.
154—Inspection and Analyses of Commercial Feeding Stuffs.
155—Recent Cotton Experiments.

Circulars.

Asparagus.
Blackleg.
Boll Weevil.
Insect Pest Law.
Underground Waters of Mississippi.
Hairy Vetch.

Address, AGRICULTURAL EXPERIMENT STATION,
Agricultural College, Miss.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi.

BULLETIN No. 156.

INSPECTION AND ANALYSES OF COTTONSEED MEAL

ON SALE IN THE STATE.

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISSISSIPPI.

April, 1912.

TUCKER PRINTING HOUSE JACKSON MISS

MISSISSIPPI FERTILIZER AND FEEDING STUFFS CONTROL.

Inspection aud Analyses of Cottonseed Meal.

W. F. HAND	State Chemist
I. D. SESSUMS	Assistant Chemist
H. S. CHILTON	Assistant Chemist
E. C. McINNIS	Inspector
a M. F. COGLON	Assistant Chemist
H. L. McGEORGE	Inspector
M. GIEGER	Assistant Chemist
H. S. MONTAGUE	Assistant Chemist
J. J. T. GRAHAM	Assistant Chemist
H. G. LEWIS	Assistant Chemist
J. C. McFARLAND	Assistant Chemist
A. LEVY	Assistant Chemist
F. N. CHISOLM	Inspector
MISS MARY GAY	Stenographer

a Resigned November 1, 1911.

THE INSPECTION
OF
COTTONSEED MEAL.

Season 1911-1912.

APRIL, 1912.

Introduction.—This bulletin contains two tables of analyses as follows:

TABLE I—Analyses of samples of cotton-seed meal drawn by inspectors from shipments in various parts of the state.

TABLE II.—Analyses of samples (so-called official samples) forwarded by oil mills in accordance with the requirements of the law.

An additional bulletin will be issued before the close of the season on October first. Inspectors are now taking samples from all parts of the state, and analyses of these samples will be sent to dealers and to manufacturers as the analytical work progresses. Prompt attention will be given requests of dealers and farmers for analyses of special samples and active inspection will be maintained throughout the season.

Accurate analyses supply the data upon which intelligent purchases of cotton-seed meal must be based. This is true whether the purchaser intends to use the meal for feeding animals or for use as a fertilizer material (i. e., for feeding plants) because its value in either case is most largely measured by the **nitrogen content.**

No meal is manufactured anywhere in large amounts that is entirely free of hulls and hulls carry approximately one-tenth as much nitrogen (and consequently of protein also) as a good grade of meal, but the quality of any lot or sample of meal cannot be decided wholly upon the basis of the percentage of hulls contained therein. This is due to the fact that the **seed** varies in composition. It can happen, therefore, that a sample containing, say, 20% of hulls may contain more nitrogen and protein than the sample from a lot carrying only 15% of hulls, due, of course, to the quality of the seed from which the two grades of meal were made. While this is true within certain limits, it is also true that a good grade of meal cannot contain a large propor-

tion of hulls, for the reason already given that hulls (which are poor in nitrogen and protein) serve only to "dilute" the meal and thereby to depress the percentage of nitrogen and of protein in the mixture. Meal practically free of hulls cannot be prepared in the ordinary processes of manufacture, though the greater proportion could be removed, of course, by separation on bolting screens, if this were desirable in special cases or commercially practicable in all cases.

Since meal is always used primarily for its content of nitrogen or protein, and since (within narrow limits on account of variation in composition of seed) the percentage of hulls is not an accurate indication of the quality of meal, it follows that meal must be valued by an actual determination of the nitrogen or protein in it and not by simply an estimation of the proportion of hulls..

That seed do vary in composition cannot be doubted. In some sections of the country it is not difficult to manufacture from seed generally obtainable and by the ordinary mill processes, meal carrying as much as 7.50% of nitrogen and such meal will contain, of course, a certain proportion of hulls, say, for purpose of illustration, 12.5%. Now, to each 100 pounds of this meal already containing 12.5% of hulls 16.5 pounds of hulls may be added, producing thereby a mixture containing a total of 25% of hulls, equivalent to 500 pounds per ton. But such a mixture will nevertheless contain (estimating the added hulls to carry 0.67% of nitrogen) as much as 6.53% of nitrogen, which would be accepted in this state as meal of good quality notwithstanding the large proportion of hulls present in it.

Comparative values.—Most buyers of meal know that the value of a ton of it depends most largely upon the percentage of nitrogen, which is a good guide, therefore, in the determination of the comparative or relative values from analyses showing the percentage of it in the lots or qualities to be compared. Analyses published in these bulletins are sufficient to illustrate the fact that variations in value are frequently significant and must be taken into account in buying. It is not satisfactory for the purchaser to conclude that an arbitrary difference in price of, say, one dollar a ton is an approximate measure of the actual difference in value between two grades of meal. These comparative values may be computed very simply, e. g., if meal containing 6.60% of nitrogen may be had for $26.00 per ton, the value (based on nitrogen content) of a quality containing only 6.20% of nitrogen may be found by simple proportion as follows:

6.60% : 6.20% : : $26.00 : X—wherein
X equals $24.42.

The following table is inserted for the general information of purchasers:

Meal containing 7.00% of nitrogen	$28.00 per ton.
Meal containing 6.90% of nitrogen	27.60 per ton.
Meal containing 6.80% of nitrogen	27.20 per ton.
Meal containing 6.70% of nitrogen	26.80 per ton.
Meal containing 6.60% of nitrogen	26.40 per ton.
Meal containing 6.50% of nitrogen	26.00 per ton.
Meal containing 6.40% of nitrogen	25.60 per ton.
Meal containing 6.30% of nitrogen	25.20 per ton.
Meal containing 6.20% of nitrogen	24.80 per ton.

Sale of meal on a unit basis.—The sale of cotton-seed meal on the unit basis as is often done in the case of cream ought to prove very satisfactory to manufacturers, and buyers and sellers generally. A unit is one per cent. When meal containing 6.50 per cent of nitrogen is selling for $26.00 per ton, each unit is valued at $4.00, for 6.50 units (6.50 per cent) sell for $26.00 and one unit is worth, therefore, 26.00 dollars divided by 6.50 units, equals $4.00.

At $4.00 a unit meal containing 7.00% of nitrogen is worth $28.00 per ton, while meal carrying only 6.20% nitrogen should sell for $24.80 per ton, as shown by the table in the foregoing paragraph.

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	ANGUILLA COTTON OIL CO., Anguilla, Miss.	
19995	H. G. Cottonseed Meal	Anguilla Cotton Oil Co., Anguilla
	ARCOLA OIL MILL, Arcola, Miss.	
19999	H. G. Cottonseed Meal	Arcola Oil Mill, Arcola
	BELZONI OIL WORKS, Belzoni, Miss.	
20001	S. G. Cottonseed Meal	Belzoni Oil Works, Belzoni
	BROOKHAVEN COTTON OIL & FERTILIZER CO., Brookhaven, Miss.	
20033	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20034	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20035	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20036	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20037	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20038	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20039	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20040	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20041	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20042	H. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20046	H. G. Cottonseed Meal	W. F. Funchess, Osyka
20043	S. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20044	S. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
20045	S. G. Cottonseed Meal	Brookhaven Cotton Oil & Fert. Co., Brookhaven
	BUCKEYE COTTON OIL CO., Greenwood, Miss.	
19980	H. G. Cottonseed Meal	Buckeye Cotton Oil Co., Greenwood

Collected by State Chemist, Season 1911-1912.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
19995	7.00	6.22	*6.18*	7.56	*7.51*	26.44	*26.27*
19999	7.21	5.94	*6.18*	7.22	*7.51*	25.25	*26.27*
20001	8.19	5.57	*4.95*	6.77	*6.02*	23.67	*21.04*
20033	7.31	6.57	*6.18*	7.99	*7.51*	27.92	*26.27*
20034	8.15	6.43	*6.18*	7.82	*7.51*	27.33	*26.27*
20035	7.90	6.50	*6.18*	7.90	*7.51*	27.63	*26.27*
20036	7.91	6.56	*6.18*	7.98	*7.51*	27.88	*26.27*
20037	7.08	6.45	*6.18*	7.84	*7.51*	27.41	*26.27*
20038	7.08	6.53	*6.18*	7.94	*7.51*	27.75	*26.27*
20039	8.32	6.24	*6.18*	7.59	*7.51*	26.52	*26.27*
20040	8.05	6.44	*6.18*	7.83	*7.51*	27.37	*26.27*
20041	7.62	6.06	*6.18*	7.37	*7.51*	25.76	*26.27*
20042	8.19	6.31	*6.18*	7.67	*7.51*	26.82	*26.27*
20046	6.96	6.51	*6.18*	7.91	*7.51*	27.67	*26.27*
20043	8.04	6.52	*4.95*	7.93	*6.02*	27.71	*21.04*
20044	7.31	6.57	*4.95*	7.99	*6.02*	27.92	*21.04*
20045	7.96	6.53	*4.95*	7.94	*6.02*	27.75	*21.04*
19980	4.82	6.40	*6.18*	7.78	*7.51*	27.20	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	BUCKEYE COTTON OIL CO., Jackson, Miss.	
19934	H. G. Cottonseed Meal	Farmers Warehouse Co., Winona
19941	H. G. Cottonseed Meal	J. L. Hammond, Kosciusko
	CANTON OIL MILL COMPANY, Canton, Miss.	
19968	H. G. Cottonseed Meal	Canton Oil Mill Co., Canton
20016	H. G. Cottonseed Meal	Paragon Gin Co., Canton
20017	H. G. Cottonseed Meal	Canton Oil Mill Co., Canton
20018	H. G. Cottonseed Meal	Canton Oil Mill Co., Canton
	CENTRAL COTTON OIL CO., Jackson, Miss.	
19967	H. G. Cottonseed Meal	Central Cotton Oil Co., Jackson
	CLAY COUNTY COT. OIL CO., West Point, Miss.	
19675	H. G. Cottonseed Meal	Clay County Cot. Oil Co., West Pt.
	COLDWATER COTTON OIL CO., Coldwater, Miss.	
19974	H. G. Cottonseed Meal	Coldwater Cot. Oil Co., Coldwater
	DEESON OIL MILLS, Deeson, Miss.	
19984	H. G. Cottonseed Meal	Deeson Oil Mills, Deeson
	DeSOTO OIL COMPANY, Greenville, Miss.	
19993	S. G. Cottonseed Meal	DeSoto Oil Co., Greenville
	EAGLE COTTON OIL COMPANY, Meridian, Miss.	
19682	H. G. Cottonseed Meal	Eagle Cotton Oil Co., Meridian
	EASTMAN OIL MILLS, Jonestown, Miss.	
19983	H. G. Cottonseed Meal	Eastman Oil Mills, Jonestown

Collected by State Chemist, Season 1911-1912.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
19934	8.07	6.29	*6.18*	7.65	*7.51*	26.73	*26.27*
19941	7.88	6.32	*6.18*	7.68	*7.51*	26.86	*26.27*
19968	6.22	6.31	*6.18*	7.67	*7.51*	26.82	*26.27*
20016	7.51	6.46	*6.18*	7.85	*7.51*	27.46	*26.27*
20017	7.40	6.59	*6.18*	8.01	*7.51*	28.01	*26.27*
20018	6.96	6.48	*6.18*	7.88	*7.51*	27.54	*26.27*
19967	7.52	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
19675	6.78	6.40	*6.18*	7.78	*7.51*	27.20	*26.27*
19974	7.75	6.47	*6.18*	7.87	*7.51*	27.50	*26.27*
19984	7.40	5.68	*6.18*	6.91	*7.51*	24.14	*26.27*
19993	6.08	5.92	*4.95*	7.20	*6.02*	25.16	*21.04*
19682	7.40	6.38	*6.18*	7.76	*7.51*	27.12	*26.27*
19983	7.88	5.76	*6.18*	7.00	*7.51*	24.48	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	GLEN ALLAN OIL MILL, Glen Allan, Miss.	
19994	H. G. Cottonseed Meal	Glen Allan Oil Mill, Glen Allan
	GRENADA OIL MILL, Grenada, Miss.	
19937	H. G. Cottonseed Meal	Grenada Oil Mill, Grenada
19938	H. G. Cottonseed Meal	Grenada Oil Mill, Grenada
19977	H. G. Cottonseed Meal	Grenada Oil Mill, Grenada
	HOLLANDALE COT. OIL MILL, Hollandale, Miss.	
19997	S. G. Cottonseed Meal	Hollandale Cot. Oil Mill, Hollandale
	IMPERIAL COTTON OIL CO., Macon, Miss.	
19684	S. G. Cottonseed Meal	Imperial Cotton Oil Co., Macon
	INDEPENDENT OIL & FERT. WORKS, Columbus, Miss.	
19924	H. G. Cottonseed Meal	Independent Oil & Fert. Works, Columbus
	INDIANOLA COTTON OIL CO., Indianola, Miss.	
19925	S. G. Cottonseed Meal	W. M. Sheffield, Maben
20000	S. G. Cottonseed Meal	Indianola Cotton Oil Co., Indianola
	ITTA BENA COTTON OIL CO., Itta Bena, Miss.	
19979	H. G. Cottonseed Meal	Itta Bena Cotton Oil Co., Itta Bena
	JACKSON OIL & REFINING CO., Jackson, Miss.	
19966	H. G. Cottonseed Meal	Jackson Oil & Ref. Co., Jackson
*20094	H. G. Cottonseed Meal	E. G. Davis, Pelahatchie
20345	H. G. Cottonseed Meal	J. K. Dunn, McComb
20346	H. G. Cottonseed Meal	W. A. Holloway, Mt. Olive
20347	H. G. Cottonseed Meal	Guy Northrop, Pass Christian

* This shipment was attached.

Collected by State Chemist, Season 1911-1912.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
19994	7.40	5.98	*6.18*	7.27	*7.51*	25.42	*26.27*
19937	8.33	6.91	*6.20*	8.40	*7.54*	29.37	*26.35*
19938	8.50	7.00	*6.20*	8.51	*7.54*	29.75	*26.35*
19977	7.22	6.37	*6.20*	7.74	*7.54*	27.07	*26.35*
19997	8.00	6.23	*5.00*	7.57	*6.08*	26.48	*21.25*
19684	9.00	5.86	*4.95*	7.12	*6.02*	24.91	*21.04*
19924	9.93	6.79	*6.18*	8.26	*7.51*	28.86	*26.27*
19925	6.86	6.08	*4.95*	7.39	*6.02*	25.84	*21.04*
20000	7.09	6.61	*4.95*	8.04	*6.02*	28.09	*21.04*
19979	6.25	6.28		7.64		26.69	
19966	6.77	5.76	*6.18*	7.00	*7.51*	24.48	*26.27*
20094	8.27	5.60	*6.18*	6.81	*7.51*	23.80	*26.27*
20345	8.05	6.21	*6.18*	7.55	*7.51*	26.39	*26.27*
20346	7.73	6.03	*6.18*	7.33	*7.51*	25.63	*26.27*
20347	8.15	6.33	*6.18*	7.70	*7.51*	26.90	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	LAUREL OIL & FERT. CO., Laurel, Miss.	
19678	H. G. Cottonseed Meal, 6.59%	Laurel Oil & Fert. Co., Laurel
	LELAND OIL WORKS, Leland, Miss.	
19998	S. G. Cottonseed Meal	Leland Oil Works, Leland
	LEXINGTON COTTON OIL CO., Lexington, Miss.	
19944	H. G. Cottonseed Meal	Lexington Cot. Oil Co., Lexington
19945	H. G. Cottonseed Meal	Lexington Cot. Oil Co., Lexington
19946	H. G. Cottonseed Meal	Lexington Cot. Oil Co., Lexington
19971	H. G. Cottonseed Meal	Lexington Cot. Oil Co., Lexington
	MERIDIAN FERT. FACTORY, Hattiesburg, Miss.	
19676	H. G. Golden Rod Cotton-seed Meal	Meridian Fert. Factory, Hattiesburg
19677	H. G. Cottonseed Meal	Meridian Fert. Factory, Hattiesburg
	MINTER CITY OIL WORKS, Minter City, Miss.	
19982	S. G. Cottonseed Meal	Minter City Oil Works, Minter City
	MISSISSIPPI COTTON OIL CO., Clarksdale, Miss.	
19987	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Clarksdale
	MISSISSIPPI COTTON OIL CO., Columbus, Miss.	
19923	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Columbus
	MISSISSIPPI COTTON OIL CO., Greenville, Miss.	
19991	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Greenville

Collected by State Chemist, Season 1911-1912.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
19678	8.32	6.70	*6.59*	8.15	*8.01*	28.48	*28.01*
19998	7.51	6.29	*4.95*	7.65	*6.02*	26.73	*21.04*
19944	7.94	6.54	*6.18*	7.95	*7.51*	27.80	*26.27*
19945	7.60	6.50	*6.18*	7.90	*7.51*	27.63	*26.27*
19946	8.41	6.41	*6.18*	7.79	*7.51*	27.24	*26.27*
19971	5.95	6.48	*6.18*	7.88	*7.51*	27.54	*26.27*
19676	8.72	6.67	*6.59*	8.11	*8.01*	28.35	*28.01*
19677	8.57	6.62	*6.18*	8.05	*7.51*	28.14	*26.27*
19982	7.95	6.15	*4.95*	7.48	*6.02*	26.14	*21.04*
19987	7.39	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
19923	7.22	6.18	*6.18*	7.51	*7.51*	26.27	*26.27*
19991	7.48	6.20	*6.18*	7.54	*7.51*	26.35	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	MISSISSIPPI COTTON OIL CO., Grenada, Miss.	
19935	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Grenada
19936	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Grenada
19943	H. G. Cottonseed Meal	Durant Ice & Coal Co., Durant
19976	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Grenada
	MISSISSIPPI COTTON OIL CO., Jackson, Miss.	
19942	H. G. Cottonseed Meal	J. D. Ray, Kosciusko
19965	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20008	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20009	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20010	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20011	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20012	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20013	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20014	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20015	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20026	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Natchez
20027	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Natchez
20002	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20003	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20004	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20005	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20006	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
20007	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Jackson
	MISSISSIPPI COTTON OIL CO., Meridian, Miss.	
19681	H. G. Cottonseed Meal	Miss. Cotton Oil Co., Meridian
	MISSISSIPPI COTTON OIL CO., West Point, Miss.	
19674	H. G. Cottonseed Meal	Miss. Cotton Oil Co., West Point
	MISSISSIPPI COTTON OIL CO., Yazoo City, Miss.	
19953	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Yazoo City
19954	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Yazoo City
19955	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Yazoo City
19956	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Yazoo City
19957	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Yazoo City
19969	S. G. Cottonseed Meal	Miss. Cotton Oil Co., Yazoo City

Collected by State Chemist, Season 1911-1912.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
19935	7.67	6.24	*6.18*	7.59	*7.51*	26.52	*26.27*
19936	8.26	6.40	*6.18*	7.78	*7.51*	27.20	*26.27*
19943	8.22	6.32	*6.18*	7.68	*7.51*	26.86	*26.27*
19976	7.51	6.22	*6.18*	7.56	*7.51*	26.44	*26.27*
19942	8.50	6.38	*6.18*	7.76	*7.51*	27.12	*26.27*
19965	7.42	6.67	*6.18*	8.11	*7.51*	28.35	*26.27*
20008	7.47	6.24	*6.18*	7.59	*7.51*	26.52	*26.27*
20009	7.36	6.23	*6.18*	7.57	*7.51*	26.48	*26.27*
20010	7.63	6.28	*6.18*	7.64	*7.51*	26.69	*26.27*
20011	7.11	6.12	*6.18*	7.44	*7.51*	26.01	*26.27*
20012	7.34	6.21	*6.18*	7.55	*7.51*	26.39	*26.27*
20013	6.97	6.25	*6.18*	7.60	*7.51*	26.56	*26.27*
20014	6.95	6.18	*6.18*	7.51	*7.51*	26.27	*26.27*
20015	7.81	6.18	*6.18*	7.51	*7.51*	26.27	*26.27*
20026	8.10	6.31	*6.18*	7.67	*7.51*	26.82	*26.27*
20027	7.83	6.23	*6.18*	7.57	*7.51*	26.48	*26.27*
20002	8.58	6.09	*4.95*	7.40	*6.02*	25.88	*21.04*
20003	8.48	5.95	*4.95*	7.23	*6.02*	25.29	*21.04*
20004	7.25	5.96	*4.95*	7.25	*6.02*	25.33	*21.04*
20005	8.11	5.87	*4.95*	7.14	*6.02*	24.95	*21.04*
20006	6.81	6.07	*4.95*	7.38	*6.02*	25.80	*21.04*
20007	7.71	5.98	*4.95*	7.27	*6.02*	25.42	*21.04*
19681	9.79	6.01	*6.18*	7.31	*7.51*	25.54	*26.27*
19674	9.04	6.22	*6.18*	7.56	*7.51*	26.44	*26.27*
19953	8.44	5.79	*4.95*	7.04	*6.02*	24.61	*21.04*
19954	8.00	5.71	*4.95*	6.94	*6.02*	24.27	*21.04*
19955	8.21	5.74	*4.95*	6.98	*6.02*	24.40	*21.04*
19956	8.24	5.40	*4.95*	6.57	*6.02*	22.95	*21.04*
19957	8.19	5.31	*4.95*	6.46	*6.02*	22.57	*21.04*
19969	7.95	6.21	*4.95*	7.55	*6.02*	26.39	*21.04*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	NATCHEZ OIL COMPANY, Natchez, Miss.	
20028	H. G. Cottonseed Meal	Natchez Oil Co., Natchez
20029	H. G. Cottonseed Meal	Natchez Oil Co., Natchez
20030	H. G. Cottonseed Meal	Natchez Oil Co., Natchez
20031	H. G. Cottonseed Meal	Natchez Oil Co., Natchez
20032	H. G. Cottonseed Meal	Natchez Oil Co., Natchez
	NEWTON OIL & M'F'G. CO., Newton, Miss.	
19679	H. G. Cottonseed Meal	Newton Oil & M'f'g. Co., Newton
	OKOLONA OIL COMPANY, Okolona, Miss.	
19673	H. G. Cottonseed Meal	Okolona Oil Co., Okolona
	PEOPLES COTTON OIL & FIBRE COMPANY, North Carrollton, Miss.	
19978	H. G. Cottonseed Meal	Peoples Cotton Oil & Fibre Co., North Carrollton
	PHOENIX COTTON OIL CO., Como, Miss.	
19926	H. G. Cottonseed Meal	Butler & Fife, New Albany
19973	H. G. Cottonseed Meal	Phoenix Cotton Oil Co., Como
	PLANTERS GIN & OIL CO., Baldwyn, Miss.	
19671	H. G. Cottonseed Meal	Planters Gin & Oil Co., Baldwyn
	PLANTERS OIL MILL, Tunica, Miss.	
19985	H. G. Cottonseed Meal	Planters Oil Mill, Tunica
	PLANTERS OIL MILL & GIN CO. Kosciusko, Miss.	
19939	H. G. Cottonseed Meal	Planters Oil Mill & Gin Co., K'sko
19940	H. G. Cottonseed Meal	M. T. Allen, Kosciusko

Collected by State Chemist, Season 1911-1912.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
20028	7.15	6.26	*6.18*	7.61	*7.51*	26.61	*26.27*
20029	4.94	6.28	*6.18*	7.64	*7.51*	26.69	*26.27*
20030	6.26	6.54	*6.18*	7.95	*7.51*	27.80	*26.27*
20031	6.42	6.68	*6.18*	8.12	*7.51*	28.39	*26.27*
20032	5.73	6.67	*6.18*	8.11	*7.51*	28.35	*26.27*
19679	7.86	6.25	*6.18*	7.60	*7.51*	26.56	*26.27*
19673	8.49	6.14	*6.18*	7.47	*7.51*	26.10	*26.27*
19978	7.59	6.23	*6.18*	7.58	*7.51*	26.48	*26.27*
19926	6.44	6.49	*6.18*	7.89	*7.51*	27.58	*26.27*
19973	6.55	6.61	*6.18*	8.04	*7.51*	28.09	*26.27*
19671	7.53	6.75	*6.18*	8.21	*7.51*	28.69	*26.27*
19985	6.35	6.32	*6.50*	7.68	*7.90*	26.86	*27.63*
19939	8.05	6.63	*6.18*	8.06	*7.51*	28.18	*26.27*
19940	7.72	6.66	*6.18*	8.10	*7.51*	28.31	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	PLANTERS OIL MILL & M'F'G. COMPANY, Greenwood, Miss.	
19981	H. G. Cottonseed Meal	Planters Oil Mill & M'f'g. Co., Greenwood
	PLANTERS OIL WORKS, Clarksdale, Miss.	
19986	S. G. Cottonseed Meal	Planters Oil Works, Clarksdale
	PONTOTOC COTTON OIL CO., Pontotoc, Miss.	
19927	H. G. Cottonseed Meal	Pontotoc Cotton Oil Co., Pontotoc
	PRODUCERS COTTON OIL CO., Yazoo City, Miss.	
19958	H. G. Cottonseed Meal	Producers Cot. Oil Co., Yazoo City
19959	H. G. Cottonseed Meal	Producers Cot. Oil Co., Yazoo City
19960	H. G. Cottonseed Meal	Producers Cot. Oil Co., Yazoo City
19961	H. G. Cottonseed Meal	Producers Cot. Oil Co., Yazoo City
19962	H. G. Cottonseed Meal	Producers Cot. Oil Co., Yazoo City
19963	H. G. Cottonseed Meal	Producers Cot. Oil Co., Yazoo City
19964	H. G. Cottonseed Meal	Producers Cot. Oil Co., Yazoo City
19970	H. G. Cottonseed Meal	Producers Cot. Oil Co., Yazoo City
	REFUGE COTTON OIL CO., Columbus, Miss.	
19922	H. G. Cottonseed Meal	Refuge Cotton Oil Co., Columbus
	REFUGE COTTON OIL CO., Greenville, Miss.	
19992	S. G. Cottonseed Meal	Refuge Cotton Oil Co., Greenville
	REFUGE COTTON OIL CO., Rosedale, Miss.	
19990	S. G. Cottonseed Meal	Refuge Cotton Oil Co., Rosedale
	RICHMOND COTTON OIL CO., Corinth, Miss.	
19670	H. G. Cottonseed Meal	Richmond Cot. Oil Co., Corinth

Collected by State Chemist, Season 1911-1912.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
19981	6.55	6.19	*6.18*	7.53	*7.51*	26.31	*26.27*
19986	5.42	6.07	*5.00*	7.38	*6.08*	25.80	*21.25*
19927	6.33	6.97	*6.50*	8.47	*7.90*	29.62	*27.63*
19958	8.30	6.08	*6.18*	7.39	*7.51*	25.84	*26.27*
19959	7.43	6.02	*6.18*	7.32	*7.51*	25.59	*26.27*
19960	5.89	6.66	*6.18*	8.10	*7.51*	28.31	*26.27*
19961	6.35	6.07	*6.18*	7.38	*7.51*	25.80	*26.27*
19962	11.57	6.53	*6.18*	7.94	*7.51*	27.75	*26.27*
19963	6.14	6.51	*6.18*	7.91	*7.51*	27.67	*26.27*
19964	6.37	6.54	*6.18*	7.95	*7.51*	27.80	*26.27*
19970	6.95	6.14	*6.18*	7.47	*7.51*	26.10	*26.27*
19922	6.88	6.24	*6.18*	7.59	*7.51*	26.52	*26.27*
19992	7.91	5.91	*4.95*	7.19	*6.02*	25.12	*21.04*
19990	7.68	5.64	*4.95*	6.86	*6.02*	23.97	*21.04*
19670	8.53	6.84	*6.18*	8.32	*7.51*	29.07	*26.27*

TABLE I.—Analyses of Cottonseed Meal

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	ROLLING FORK OIL COMPANY, Rolling Fork, Miss.	
19996	S. G. Cottonseed Meal	Rolling Fork Oil Co., Rolling Fork
	SENATOBIA COTTON OIL CO., Senatobia, Miss.	
19975	H. G. Cottonseed Meal	Senatobia Cot. Oil Co., Senatobia
	SHAW COTTON OIL CO., Shaw, Miss.	
19989	S. G. Cottonseed Meal	Shaw Cotton Oil Co., Shaw
	SHELBY OIL COMPANY, Shelby, Miss.	
19988	S. G. Cottonseed Meal	Shelby Oil Co., Shelby
	SHUBUTA OIL & M'F'G. CO., Shubuta, Miss.	
19683	H. G. Cottonseed Meal	Shubuta Oil & M'f'g. Co., Shubuta
	SOUTHERN OIL & FERT. CO., Meridian, Miss.	
19680	H. G. Cottonseed Meal, 6.18%	J. L. Long, City Warehouse, M'dian
	TUPELO OIL & ICE COMPANY, Tupelo, Miss.	
19672	H. G. Cottonseed Meal	Tupelo Oil & Ice Co., Tupelo
	WINONA OIL & M'F'G. CO., Winona, Miss.	
19928	H. G. Cottonseed Meal	Winona Oil & M'f'g. Co., Winona
19929	H. G. Cottonseed Meal	Winona Oil & M'f'g. Co., Winona
19930	H. G. Cottonseed Meal	Winona Oil & M'f'g. Co., Winona
19931	H. G. Cottonseed Meal	Winona Oil & M'f'g. Co., Winona
19932	H. G. Cottonseed Meal	Winona Oil & M'f'g. Co., Winona
19933	H. G. Cottonseed Meal	Winona Oil & M'f'g. Co., Winona
19972	H. G. Cottonseed Meal	Winona Oil & M'f'g. Co., Winona

Collected by State Chemist, Season 1911-1912.

Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
19996	7.23	6.25	*5.00*	7.60	*6.08*	26.56	*21.25*
19975	7.08	6.65	*6.18*	8.09	*7.51*	28.26	*26.27*
19989	6.90	5.60	*4.95*	6.81	*6.02*	23.80	*21.04*
19988	7.33	6.04	*6.00*	7.34	*7.29*	25.67	*25.50*
19683	8.07	6.87	*6.18*	8.35	*7.51*	29.20	*26.27*
19680	7.48	6.84	*6.18*	8.32	*7.51*	29.07	*26.27*
19672	8.95	6.56	*6.60*	7.98	*8.02*	27.88	*28.05*
19928	6.95	6.44	*6.18*	7.83	*7.51*	27.37	*26.27*
19929	6.68	6.78	*6.18*	8.24	*7.51*	28.82	*26.27*
19930	6.96	6.46	*6.18*	7.85	*7.51*	27.46	*26.27*
19931	6.28	6.58	*6.18*	8.00	*7.51*	27.97	*26.27*
19932	6.21	6.63	*6.18*	8.06	*7.51*	28.18	*26.27*
19933	7.08	6.27	*6.18*	7.62	*7.51*	26.65	*26.27*
19972	6.55	6.72	*6.18*	8.17	*7.51*	28.56	*26.27*

TABLE II.—Analyses of Official Samples of Cottonseed Meal Registered for Sale in the State, with Guarantees for Season 1911-1912.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
	ALABAMA COTTON OIL CO., Mobile, Ala.								
19638	H. G. Cottonseed Meal	19638	9.70	6.08	*6.18*	7.39	*7.51*	25.84	*26.27*
	ARCOLA OIL MILL, Arcola, Miss.								
20285	H. G. Cottonseed Meal	20285	9.99	6.44	*6.18*	7.83	*7.51*	27.37	*26.27*
	BARBER & LEWIS OIL COMPANY, Edwards, Miss.								
19639	H. G. Cottonseed Meal	19639	9.05	6.28	*6.18*	7.64	*7.51*	26.69	*26.27*
	BELZONI OIL WORKS, Belzoni, Miss.								
20286	S. G. Cottonseed Meal	20286	10.30	5.83	*4.95*	7.09	*6.02*	24.78	*21.04*
	BROOKHAVEN COTTON OIL & FERTILIZER COMPANY, Brookhaven, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	S. G. Cottonseed Meal				*4.95*		*6.02*		*21.04*

	BUCKEYE COTTON OIL COMPANY, Jackson, Miss.								
19640	H. G. Cottonseed Meal	19640	9.35	6.43	*6.18*	7.82	*7.51*	27.33	*26.27*
	CANTON OIL MILL COMPANY, Canton, Miss.								
19641	H. G. Cottonseed Meal	19641	8.91	6.46	*6.18*	7.85	*7.51*	27.46	*26.27*
	CENTRAL COTTON OIL COMPANY, Jackson, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	CHICKASAW OIL MILL, Memphis, Tenn.								
19666	H. G. Cottonseed Meal	19666	7.51	6.72	*6.18*	8.17	*7.51*	28.56	*26.27*
	CLAY COUNTY COTTON OIL COMPANY, West Point, Miss.								
19642	H. G. Cottonseed Meal	19642	8.55	6.21	*6.18*	7.55	*7.51*	26.39	*26.27*
	COLDWATER COTTON OIL COMPANY, Coldwater, Miss.								
20288	H. G. Cottonseed Meal 6.18%	20288	9.32	6.63	*6.18*	8.06	*7.51*	28.18	*26.27*
	H. G. Cottonseed Meal 6.59%				*6.59*		*8.01*		*28.01*
	CRYSTAL SPRINGS OIL MILL, FERT. & M'F'G. COMPANY, Crystal Springs, Miss.								
20067	H. G. Cottonseed Meal	20067	8.02	7.16	*6.18*	8.71	*7.51*	30.43	*26.27*
	DEESON OIL MILL, Deeson, Miss.								
19915	H. G. Cottonseed Meal	19915	6.30	6.00	*6.18*	7.29	*7.51*	25.50	*26.27*

TABLE II.—Analyses of Official Samples of Cottonseed Meal Registered for Sale in the State, with Guarantees for Season 1911-1912.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
	DELTA OIL COMPANY, Greenville, Miss.								
19643	S. G. Cottonseed Meal	19643	8.42	5.23	*4.95*	6.36	*6.02*	22.23	*21.04*
	DeSOTO OIL COMPANY, Greenville, Miss.								
19644	S. G. Cottonseed Meal	19644	9.40	6.54	*4.95*	7.95	*6.02*	27.80	*21.04*
	DUMAS GROCERY COMPANY, Mobile, Ala.								
20107	H. G. Cottonseed Meal	20107	7.87	6.17	*6.30*	7.50	*7.66*	26.22	*26.78*
	EAGLE COTTON OIL COMPANY, Meridian, Miss.								
20105	H. G. Cottonseed Meal	20105	8.35	6.62	*6.18*	8.05	*7.51*	28.14	*26.27*
	EASTMAN OIL MILLS, Jonestown, Miss.								
20368	H. G. Cottonseed Meal	20368	8.57	6.27	*6.18*	7.62	*7.51*	26.65	*26.27*

	M. FORCHEIMER & COMPANY, Mobile, Ala.								
20366	H. G. Cottonseed Meal	20366	9.12	6.35	*6.18*	7.72	*7.51*	26.99	*26.27*
	FRIARS POINT OIL MILL & M'F'G. COMPANY, Friars Point, Miss.								
20401	S. G. Cottonseed Meal	20401	8.90	6.44	*4.95*	7.83	*6.02*	27.37	*21.04*
	A. H. GEORGE COMPANY, Meridian, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	J. T. GIBBONS, New Orleans, La.								
20290	H. G. Cottonseed Meal	20290	8.46	6.10	*6.18*	7.42	*7.51*	25.93	*26.27*
20291	O. G. Cottonseed Meal	20291	10.11	3.36	*3.50*	4.09	*4.26*	14.28	*14.88*
	GLEN ALLAN OIL MILLS, Glen Allan, Miss.								
20109	H. G. Cottonseed Meal	20109	8.43	5.94	*6.18*	7.22	*7.51*	25.25	*26.27*
	GRENADA OIL MILL, Grenada, Miss.								
20363	H. G. Cottonseed Meal	20363	8.44	6.95	*6.20*	8.45	*7.54*	29.54	*26.35*
	GULFPORT FERTILIZER COMPANY, Gulfport, Miss.								
19783	H. G. Cottonseed Meal	19783	8.83	6.43	*6.18*	7.82	*7.51*	27.33	*26.27*
	HAZLEHURST OIL MILL & FERTILIZER COMPANY, Hazlehurst, Miss.								
19691	H. G. Cottonseed Meal	19691	10.25	6.97	*6.20*	8.47	*7.54*	29.62	*26.35*

TABLE II.—Analyses of Official Samples of Cottonseed Meal Registered for Sale in the State, with Guarantees for Season 1911-1912.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
	HOLLANDALE COTTON OIL MILL, Hollandale, Miss.								
19645	S. G. Cottonseed Meal	19645	8.77	5.91	*5.00*	7.19	*6.08*	25.12	*21.25*
	IMPERIAL COTTON OIL COMPANY, Macon, Miss.								
20289	S. G. Cottonseed Meal	20289	10.14	5.98	*4.95*	7.27	*6.02*	25.42	*21.04*
	INDEPENDENT OIL & FERTILIZER WORKS, Columbus, Miss.								
20284	H. G. Cottonseed Meal	20284	9.37	6.75	*6.18*	8.21	*7.51*	28.69	*26.27*
	INDIANOLA COTTON OIL COMPANY, Indianola, Miss.								
19646	S. G. Cottonseed Meal	19646	8.49	6.16	*4.95*	7.49	*6.02*	26.18	*21.04*
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	JACKSON FERTILIZER COMPANY, Jackson, Miss.								
19838	H. G. Cottonseed Meal	19838	9.15	6.45	*6.18*	7.84	*7.51*	27.41	*26.27*

	JACKSON OIL & REFINING COMPANY, Jackson, Miss.								
19647	H. G. Cottonseed Meal	19647	9.19	6.20	*6.18*	7.54	*7.51*	26.35	*26.27*
	S. G. Cottonseed Meal				*4.95*		*6.02*		*21.04*
	LAUREL OIL & FERTILIZER COMPANY, Laurel, Miss.								
20282	H. G. Cottonseed Meal 6.59%	20282	8.07	6.74	*6.59*	8.19	*8.01*	28.65	*28.01*
20283	H. G. Cottonseed Meal 6.18%	20283	8.73	6.51	*6.18*	7.91	*7.51*	27.67	*26.27*
	LELAND OIL WORKS, Leland, Miss.								
	S. G. Cottonseed Meal				*4.95*		*6.02*		*21.04*
	LEXINGTON COTTON OIL COMPANY, Lexington, Miss.								
19648	H. G. Cottonseed Meal	19648	8.88	6.61	*6.18*	8.04	*7.51*	28.09	*26.27*
	McINNIS BROTHERS, Meridian, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	McINNIS & STURGIS MILLING COMPANY, Meridian, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	GEO. B. MATTHEWS & SONS, New Orleans, La.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*

TABLE II.—Analyses of Official Samples of Cottonseed Meal Registered for Sale in the State, with Guarantees for Season 1911-1912.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number	Moisture—Per Cent	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
	MERIDIAN FERTILIZER FACTORY, Meridian, Miss.								
	H. G. Golden Rod Cottonseed Meal				*6.59*		*8.01*		*28.01*
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	MINTER CITY OIL WORKS, Minter City, Miss.								
19649	S. G. Cottonseed Meal	19649	9.32	5.38	*4.95*	6.54	*6.02*	22.87	*21.04*
	MISSISSIPPI COTTON OIL COMPANY, Jackson, Miss.								
19650	H. G. Cottonseed Meal	19650	8.95	6.09	*6.18*	7.40	*7.51*	25.88	*26.27*
20287	S. G. Cottonseed Meal	20287	9.79	5.98	*4.95*	7.27	*6.02*	25.42	*21.04*
	MISSISSIPPI FERTILIZER COMPANY, Jackson, Miss.								
19869	H. G. Cottonseed Meal	19869	8.82	6.22	*6.18*	7.56	*7.51*	26.44	*26.27*
	MONROE COUNTY COTTON OIL COMPANY, Aberdeen, Miss.								
20055	H. G. Cottonseed Meal 6.18%	20055	6.36	6.68	*6.18*	8.12	*7.51*	28.39	*26.27*
20068	H. G. Cottonseed Meal 6.59%	20068	6.17	6.97	*6.59*	8.47	*8.01*	29.62	*28.01*

	NATCHEZ OIL COMPANY, Natchez, Miss.								
19667	H. G. Cottonseed Meal	19667	9.37	5.92	*6.18*	7.20	*7.51*	25.16	*26.27*
	NEWTON OIL & M'F'G. COMPANY, Newton, Miss.								
20108	H. G. Cottonseed Meal	20108	8.32	6.57	*6.18*	7.99	*7.51*	28.92	*26.27*
	NORTH MISSISSIPPI OIL MILLS, Holly Springs, Miss.								
19651	H. G. Cottonseed Meal	19651	8.52	6.68	*6.18*	8.12	*7.51*	28.39	*26.27*
	OKOLONA OIL COMPANY, Okolona, Miss.								
19652	H. G. Cottonseed Meal	19652	7.95	6.87	*6.18*	8.35	*7.51*	29.20	*26.27*
	OXFORD OIL MILL COMPANY, Oxford, Miss.								
19653	H. G. Cottonseed Meal	19653	8.35	6.79	*6.18*	8.26	*7.51*	28.86	*26.27*
	PEOPLES COTTON OIL & FIBRE COMPANY, North Carrollton, Miss.								
19654	H. G. Cottonseed Meal	19654	8.67	6.15	*6.18*	7.48	*7.51*	26.14	*26.27*
	PHOENIX COTTON OIL COMPANY, Como, Miss.								
19655	H. G. Cottonseed Meal	19655	7.89	6.74	*6.18*	8.19	*7.51*	28.65	*26.27*
	PLANTERS GIN & OIL COMPANY, Baldwyn, Miss.								
19657	H. G. Cottonseed Meal	19657	9.30	6.63	*6.18*	8.06	*7.51*	28.18	*26.27*

TABLE II.—Analyses of Official Samples of Cottonseed Meal Registered for Sale in the State, with Guarantees for Season 1911-1912.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
	PLANTERS OIL MILL, Tunica, Miss.								
19668	H. G. Cottonseed Meal	19668	8.52	6.17	*6.50*	7.50	*7.90*	26.22	*27.63*
	PLANTERS OIL MILL & GIN COMPANY, Kosciusko, Miss.								
20369	H. G. Cottonseed Meal	20369	8.20	6.56	*6.18*	7.98	*7.51*	27.88	*26.27*
	PLANTERS OIL MILL & M'F'G. COMPANY, Greenwood, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	PLANTERS OIL WORKS, Clarksdale, Miss.								
19656	S. G. Cottonseed Meal	19656	8.55	6.11	*5.00*	7.43	*6.08*	25.97	*21.25*
	PONTOTOC COTTON OIL COMPANY, Pontotoc, Miss.								
19658	H. G. Cottonseed Meal	19658	9.12	6.62	*6.50*	8.05	*7.90*	28.14	*27.63*

	PORT GIBSON OIL WORKS, Port Gibson, Miss.								
19659	S. G. Cottonseed Meal	19659	10.67	6.93	*4.95*	8.43	*6.02*	29.45	*21.04*
	PRODUCERS COTTON OIL COMPANY, Yazoo City, Miss.								
20338	H. G. Cottonseed Meal	20338	7.97	6.26	*6.18*	7.61	*7.51*	26.61	*26.27*
	REFUGE COTTON OIL COMPANY, Columbus, Miss.								
	H. G. Cottonseed Meal				*6.59*		*8.01*		28.01
	REFUGE COTTON OIL COMPANY, Vicksburg, Miss.								
19661	H. G. Cottonseed Meal	19661	10.20	6.08	*6.18*	7.39	*7.51*	25.84	*26.27*
19660	S. G. Cottonseed Meal	19660	10.67	5.92	*4.95*	7.20	*6.02*	25.16	*21.04*
	RICHMOND COTTON OIL COMPANY, Corinth, Miss.								
19662	H. G. Cottonseed Meal	19662	9.55	6.69	*6.18*	8.13	*7.51*	28.43	*26.27*
	ROLLING FORK OIL COMPANY, Rolling Fork, Miss.								
	S. G. Cottonseed Meal				*5.00*		*6.08*		*21.25*
	SENATOBIA COTTON OIL COMPANY, Senatobia, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	SHAW COTTON OIL COMPANY, Shaw, Miss.								
	S. G. Cottonseed Meal				*4.95*		*6.02*		*21.04*

TABLE II.—Analyses of Official Samples of Cottonseed Meal Registered for Sale in the State, with Guarantees for Season 1911-1912.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
	PLANTERS OIL MILL, Tunica, Miss.								
19668	H. G. Cottonseed Meal	19668	8.52	6.17	*6.50*	7.50	*7.90*	26.22	*27.63*
	PLANTERS OIL MILL & GIN COMPANY, Kosciusko, Miss.								
20369	H. G. Cottonseed Meal	20369	8.20	6.56	*6.18*	7.98	*7.51*	27.88	*26.27*
	PLANTERS OIL MILL & M'F'G. COMPANY, Greenwood, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	PLANTERS OIL WORKS, Clarksdale, Miss.								
19656	S. G. Cottonseed Meal	19656	8.55	6.11	*5.00*	7.43	*6.08*	25.97	*21.25*
	PONTOTOC COTTON OIL COMPANY, Pontotoc, Miss.								
19658	H. G. Cottonseed Meal	19658	9.12	6.62	*6.50*	8.05	*7.90*	28.14	*27.63*

	PORT GIBSON OIL WORKS, Port Gibson, Miss.								
19659	S. G. Cottonseed Meal	19659	10.67	6.93	*4.95*	8.43	*6.02*	29.45	*21.04*
	PRODUCERS COTTON OIL COMPANY, Yazoo City, Miss.								
20338	H. G. Cottonseed Meal	20338	7.97	6.26	*6.18*	7.61	*7.51*	26.61	*26.27*
	REFUGE COTTON OIL COMPANY, Columbus, Miss.								
	H. G. Cottonseed Meal				*6.59*		*8.01*		28.01
	REFUGE COTTON OIL COMPANY, Vicksburg, Miss.								
19661	H. G. Cottonseed Meal	19661	10.20	6.08	*6.18*	7.39	*7.51*	25.84	*26.27*
19660	S. G. Cottonseed Meal	19660	10.67	5.92	*4.95*	7.20	*6.02*	25.16	*21.04*
	RICHMOND COTTON OIL COMPANY, Corinth, Miss.								
19662	H. G. Cottonseed Meal	19662	9.55	6.69	*6.18*	8.13	*7.51*	28.43	*26.27*
	ROLLING FORK OIL COMPANY, Rolling Fork, Miss.								
	S. G. Cottonseed Meal				*5.00*		*6.08*		*21.25*
	SENATOBIA COTTON OIL COMPANY, Senatobia, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	SHAW COTTON OIL COMPANY, Shaw, Miss.								
	S. G. Cottonseed Meal				*4.95*		*6.02*		*21.04*

TABLE II.—Analyses of Official Samples of Cottonseed Meal Registered for Sale in the State, with Guarantees for Season 1911-1912.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Nitrogen—Per Cent. Found.	Nitrogen—Per Cent. Guaranteed.	Ammonia—equivalent of Nitrogen—Found—Per Cent.	Ammonia—equivalent of Nitrogen—Guaranteed—Per Cent.	Value of Nitrogen Found—Per Ton.	Value of Nitrogen Guaranteed—Per Ton.
	SHELBY OIL COMPANY, Shelby, Miss.								
20056	H. G. Cottonseed Meal	20056	8.88	6.10	*6.18*	7.42	*7.51*	25.93	*26.27*
	S. G. Cottonseed Meal				*6.00*		*7.29*		*25.50*
	SHELBY COUNTY COTTON OIL COMPANY, Memphis, Tenn.								
20058	H. G. Cottonseed Meal	20058	7.62	6.45	*6.18*	7.84	*7.51*	27.41	*26.27*
	SHUBUTA OIL & M'F'G. COMPANY, Shubuta, Miss.								
20362	H. G. Cottonseed Meal	20362	8.04	7.32	*6.18*	8.90	*7.51*	31.11	*26.27*
	SLIDELL GROCERY & GRAIN COMPANY, Slidell, La.								
20054	S. G. Cottonseed Meal	20054	8.67	5.58	*4.95*	6.78	*6.02*	23.72	*21.04*
	SOUTHERN COTTON OIL COMPANY, Memphis, Tenn.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*

	SOUTHERN OIL & FERTILIZER CO., Meridian, Miss.								
20364	I. X. L. H. G. Cottonseed Meal 6.59%	20364	7.79	7.03	*6.59*	8.55	*8.01*	29.88	*28.01*
20365	H. G. Cottonseed Meal 6.18%	20365	9.10	6.73	*6.18*	8.18	*7.51*	28.60	*26.27*
	STARKVILLE COTTON OIL CO., Starkville, Miss.								
20406	H. G. Cottonseed Meal	20406	9.42	6.42	*6.18*	7.81	*7.51*	27.29	*26.27*
	SULLIGENT COTTON OIL COMPANY, Sulligent, Ala.								
20057	H. G. Cottonseed Meal	20057	7.93	6.16	*6.18*	7.49	*7.51*	26.18	*26.27*
	TENNESSEE COTTON OIL COMPANY, Memphis, Tenn.								
19669	H. G. Cottonseed Meal	19669	9.20	6.21	*6.18*	7.55	*7.51*	26.39	*26.27*
	TUPELO OIL & ICE COMPANY, Tupelo, Miss.								
20106	H. G. Cottonseed Meal	20106	8.15	6.65	*6.60*	8.09	*8.02*	28.26	*28.05*
	VICKSBURG COTTON OIL COMPANY, Vicksburg, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*
	J. LINDSAY WELLS COMPANY, Memphis, Tenn.								
20367	H. G. Star Cottonseed Meal	20367	8.58	6.48	*6.18*	7.88	*7.51*	27.54	*26.27*
	WINONA OIL & M'F'G. COMPANY, Winona, Miss.								
	H. G. Cottonseed Meal				*6.18*		*7.51*		*26.27*

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi.

BULLETIN No. 157.

REPORT OF WORK AT THE Delta Branch Experiment Station For 1911.

By G. B. Walker.

AGRICULTURAL COLLEGE, MISSISSIPPI.

February, 1912.

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Report of Work at the Delta Branch Experiment Station For 1911.

INTRODUCTION.

The work at the Station for the year 1911 includes general crop or demonstration work with cotton, corn, peas, oats, soy beans, alfalfa, wheat, and vetch; variety work with wheat, corn, and cotton; fertilizer work with corn, cotton, and peanuts; general work in breeding mules, cattle, and hogs; and observations on drainage.

Results and conclusions from the different lines of work are briefly reviewed below.

The season has been a most unfavorable one for practically all crops. The excessive rains during the first three weeks of April prevented the early planting of cotton, and the eight weeks of drought which followed threatened to make early corn a total failure. Then the excessive rains during August, accompanied by the cotton army worm, the boll worm, and the boll weevil, made our cotton crop considerably short of what would have been expected in a normal season. The drought during May made our spring oat crop practically a total failure, but on the other hand gave us an excellent opportunity for harvesting our fall-sown grain crops.

Our crop system was about as follows:
67 acres in corn and peas,
48 acres in cotton,
11 acres in fall oats followed by soy beans,
12 acres in spring oats followed by alfalfa in September,
12 acres in wheat and vetch followed by soy beans,
8 acres in alfalfa,
17 acres in orchard and hog pastures,
10 acres in various experimental crops,
50 acres in pastures, lots, and drives.

CORN.

Of the 67 acres planted to corn all but 15 acres grew cotton the year before and with the exception of three acres none of the land was fertilized. The 15 acres mentioned above had grown corn and peas

for two years previous. The 49 acres that grew cotton the previous year is not highly improved. It includes several acres of stiff, poorly drained land, which lowered our average yield considerably. The average yield for the 67 acres was 46 bushels. This does not represent the actual yield, for in every acre of our corn peas were planted at the rate of two bushels per acre at last plowing and the heavy growth of vines made it impossible for the men to find all the corn in harvesting. The corn that was left was made good use of, however, by the hogs that followed as soon as the harvesting was finished.

Soil preparation.—Since we have so many inquiries as to our methods of preparation and cultivation, though both are entirely local propositions, we shall briefly state our methods below.

For early planting on our well drained lands, we break flat with 12 inch sulky plows as early in fall or winter as convenient, going as deep as we can well plow and turning under as much vegetable matter as possible. The land is left in this shape until a few days before we are ready to plant, when we disc up thoroughly with a double cutaway disc harrow, half lapping each time. Then we harrow crosswise with a heavy section harrow, going as many times as necessary to finely pulverize the soil, then plant on level with a checkrow planter.

Our lands that are poorly drained we break as early in the winter as possible, plowing usually with two-horse turning-plows, putting the land in high eight foot beds. We leave the land in this shape until we are ready to plant, when we run over the beds with the disc harrow, going as many times as is necessary to work up a good seed bed. We then go crosswise the rows with the section harrow, which serves to fine the soil and to drag down the beds. Following the harrow we plant two rows on each bed, either drilling or checking as desired. This method of preparation gives better drainage and permits of earlier planting than would be possible with the land broken flat.

Time of planting.—On lands that are well drained and of a warm nature, we get best results by planting from the first to the tenth of March. We also got good results from corn planted during the first days of May. Mexican June corn, one of our best catch crops, can be planted as late as the last of June with safety. We planted this year one and a half acres of this corn on the twelfth day of July that matured good corn before frost.

Cultivation.—We begin the cultivation of our corn as soon as a crust forms, which is sometimes before the corn gets out of the ground. If a crust is formed before the corn is up well, a great deal of good

can be done by running a weeder crosswise the rows. Usually our first cultivation is given with the side harrow attachment to our two-horse walking-cultivators. After this we use the shovel attachments, to the same cultivator, at first running deep, but with the depth lessened as the corn grows larger. After the corn is too large to use two-horse cultivators, we use a one-horse cultivator, such as the "Planet Junior". We cultivate late and at the last cultivation sow cowpeas broadcast in the middles at the rate of one and a half to two bushels of seed per acre.

We advise checking corn where practicable, as it saves hoeing and more moisture can be conserved when cultivating both ways.

No man can afford to let a single acre of his land that is planted to corn go without peas sown at the last cultivation. The pea is not only a splendid source of revenue, but it fills the soil with nitrogen worth from $6.00 to $8.00 per acre per season. In field "A" the 15 acres referred to in the Introduction, we have a splendid demonstration of what a wonderful restorative agent we have in the cowpea on our Delta soils. This field has now been in corn and peas three years and without the aid of a commercial fertilizer, the peas having increased the corn yield from fifteen to twenty bushels per acre annually. The yield on this field this year, notwithstanding a sixty days' drought just at a critical stage, was 71 bushels per acre. We expect to run this field in corn and peas two more years to ascertain whether or not the increase in corn yield will be kept up in the same ratio. Besides the increase in corn yield gotten as a result of peas on the above mentioned land, the pea crop alone in 1910 amounted to $35.00 per acre.

Fertilizers.—Although we had three acres of corn fertilized, we carried on no particular experimental work with fertilizing corn this year. The three acres fertilized are well drained and of a sandy loam nature. With the exception of one acre, which was in alfalfa, the land grew cotton the previous year. It was given an application of leached barn manure at time of breaking in February, an application of 600 pounds of cottonseed meal per acre when disking seed bed for planting, and an application of 200 pounds of nitrate of soda applied in middles, June 10th. The land was broken in February an average of 10 inches deep and planted on March 15th in drills three and a half feet apart. The corn, which was left as it came up, was very thick, and as a result suffered very severely from the drought that came just at the most critical period of its growth. Two varieties of corn were planted on the three acres, Mosby and Weekley's Improved; one and

a half acres to each variety. The one and a half acres in Mosby yielded 102.5 bushels per acre at a cost of 18 cents per bushel. The Weekley's blew down and rotted so badly before we could harvest it that we were unable to get an accurate measure of the yield. A photograph of this field of corn is shown on front cover of this bulletin.

SMALL GRAINS.

It is generally conceded that the Delta is not suited to the growing of small grains, but such has not been our experience. When either oats or wheat is sown on good, well drained land during October or the first half of November, our yields are always satisfactory, and when these crops are followed by soy beans sown as soon as the land can be put in shape after the grain is removed, from the fifteenth to the last of June, the combined net proceeds from the two crops are usually as good, if not better, than that from an average crop of cotton, and will leave the soil in much better shape for the crop that is to follow.

Oats and soy beans.—In November of 1910 the Station planted eleven acres of fairly well surface-drained loam land in oats, using two and a half bushels of seed per acre. A good stand was secured and they went through the winter in fine shape, ripening the last of May, just in time to escape the effects of a six weeks' drought. The weather was ideal for harvesting and the yield was a most satisfactory one. Being in need of the oats for feeding purposes and not having a thrashing machine at that time, we failed to get a record of the yield on the whole eleven acres, but we measured off one acre of what we

considered to be a fair average of the field and saved the grain until we purchased a thrashing machine in August. From the acre we thrashed 90 bushels of very fine heavy oats.

As soon as the oats were off this eleven acres, we broke the land shallow and on June 29th planted soy beans in rows thirty inches apart, using one and a half pecks of seed per acre. The beans were given two cultivations, going once to a middle with a "Planet Junior" cultivator each time. All but one acre of the beans were cut for hay when the pods began to turn yellow and yielded an average of 5,200 pounds of cured hay per acre. One acre was left until the beans ripened to get the record of bean yield per acre. After losing a good per cent of the beans from shattering, we thrashed 22 1-2 bushels from the acre.

When planting soy beans to be thrashed for seed, it is well to plant where the land is fenced, or where hogs can run on the land for a few days after the bean crop is removed, to pick up the shattered beans, otherwise considerable loss will be sustained.

As a crop for following a grain crop in this section, there are few things that will equal the soy bean. As a hay crop it is fine. When cut at the proper stage and when properly cured, the hay is equal in feeding value to that of alfalfa, and when planted on good land under good conditions will yield an average of two tons per acre. As a bean crop it is also fine. So long as there is a demand for soy bean seed at $1.50 and up per bushel, it is an excellent crop to grow for seed. As a grazing crop for hogs, there is none better. The green foliage is as rich in protein as red clover and the bean has a higher protein content

than oil meal. In fact we know of no plant having a more useful range of possibilities than does the soy bean.

The Station recommends that crops of fall oats followed by soy beans be given more consideration when planting crop systems for the Delta cotton plantations. Since the boll weevil is a reality with us, it is possible for us to harvest our cotton crops in time to follow with fall oats, which would have been impossible heretofore. Oats do better following cotton than following corn and peas as they are not so apt to lodge.

Wheat and vetch followed by soy beans.—In November of 1910 twelve acres were seeded to wheat and vetch, using three pecks of wheat and one peck of vetch seed per acre. This was cut for hay while the wheat was in the dough stage and gave us an average yield of 2 1-2 tons per acre. This crop was followed by soy beans seeded on July 10th. The beans blighted very badly and gave us a yield of only 1 1-2 tons per acre.

Wheat and vetch sown as mentioned above, from September to November, and cut while the wheat is in the dough stage afford an excellent source of early hay of medium quality.

Variety test of wheat.—On November 3rd, 1910, the Station planted twelve varieties of wheat in plats of one-fifth acre each on good

surface-drained buckshot land. All varieties stood the winter well and matured in nice shape with but little rust. While the wheat was in shocks, a passing train set fire to the field and damaged the grain so badly that we are unable to publish absolutely correct yields, though we estimate from what was left of the varieties that the yields ran from 16 to 35 bushels per acre, with Blue Stem and Klondyke leading.

ALFALFA.

In view of the Station's five years' experience with alfalfa, we look upon it as one of our many safe and profitable crops. We had this year eight acres that were cut five times and averaged four tons per acre for the season. The first week in September we seeded another twelve acres on which we secured a good stand and it now (January, 1912) seems to be going through the winter in fine shape. We find that a well drained and fertile buckshot land is the safest on which to plant alfalfa, also that twenty to twenty-five pounds of seed per acre are sufficient.

Success with alfalfa in the Delta depends almost wholly on getting the land well drained and free from grass and weed seeds. To do this, preparation should be begun in the early spring. An excellent way is to first select the very best and most thoroughly drained piece of land available, break deeply and thoroughly, putting in lands very high and thirty feet wide, plant thickly in peas as soon as danger of frost is over, cut the peas early in July, and break the soil well again keeping

in original lands. Then keep well disked and harrowed until ready to plant during the first days of September. After planting, it is well to open up water furrows at the ends with a spade to aid drainage as much as possible.

Inoculation.—Although it is not necessary to inoculate for alfalfa on our stiff lands, we advise inoculation, particularly if one is in reach of an established alfalfa field for it usually causes a more vigorous growth and we believe it will pay. On loam soils it is very essential. The inoculation is made by sprinkling finely pulverized soil from an established alfalfa field at the rate of from two to four hundred pounds per acre at planting time or soon thereafter.

No Delta planter who has suitable land can well afford not to grow enough alfalfa for feeding his own teams.

CATTLE.

In April of 1910 the Station purchased in Kentucky, for the sum of $1,000.00, a small herd of registered Hereford cattle. In the lot were five cows, two heifer calves, and a bull. Since their arrival every member of the herd has thrived and it now numbers eighteen. The cattle are kept on white clover and Bermuda pasture from April until November and during this period are fed only a very little at times when pasture is cut short by drought. They are usually turned on fields in November where they remain until about the first of January

when they are brought to the barn and carried through the remainder of the winter on shucks, hay (usually soy bean hay), and a little corn.

Under the above conditions, which are no more than almost any Delta planter can easily provide, the cattle stay fat the year round, and our best calves are made to weigh six to seven hundred pounds at one year old. We have recently sold two yearling bulls for $150.00 each.

From our two years' experience with these cattle, we do not hesitate to claim that as good cattle can be raised in the Delta as can be raised anywhere in the state, and at a good profit.

Our pastures are on Deer Creek banks and lands that are too wet to be cultivated at a profit. They are set in white clover, Bermuda grass, and a little lespedeza, which make a most excellent pasture combination. We have had no trouble from the cattle tick, for the simple reason that our pastures were freed of ticks before we got our cattle.

There are thousands of acres of back lands in the Delta that can no longer be cropped in cotton at a profit on account of the boll weevil, and are too wet for profitable crops of corn, that would make splendid pastures if sodded to white clover, Bermuda grass, and lespedeza. To those who have lands of this character and are debating what is the best use to make of them, the Station would suggest that consideration be given to the raising of cattle of one of the beef breeds.

MULES.

The Station keeps a jack and five mares for breeding purposes, but we have done no particular experimental work with them this year. The mares range in size from 950 to 1200 pounds, and are all fairly good individuals, three of which are used at light farm work when needed. Only two colts were gotten this spring, one from the 950 pound mare and one from a 1200 pound mare. The colt out of the small mare weighed at foaling 112 pounds, while the one out of the large mare weighed 130 pounds. The colts were weighed again at six months of age and weighed 420 and 496 pounds respectively. Three of the mares are known to be in foal now and we hope to get at least three colts next spring.

The Station also has a horse colt and two mule colts that are now a year and a half old. The mules are very promising youngsters, weighing 789 and 820 pounds. They have been kept since foaling on white clover and Bermuda grass pasture, and since weaning have been fed at nights a small quantity of corn, oats, and good hay. They have cost us from weaning to date, not figuring pasture, approximately $40.00 apiece.

HOGS.

Although we have raised a considerable number of hogs at the Station this year, we have completed no particularly experimental work with them during the year.

During December we bred to a pure bred Berkshire boar, two pure bred Berkshire sows, and two pure bred Duroc-Jersey sows; and to a pure bred Duroc-Jersey boar, two pure bred Duroc-Jersey sows, and two pure bred Berkshire sows. A record will be kept of the pigs from these sows from birth until they reach the market with a view of finding which is the most profitable market hog, the pure bred Berkshire, the pure bred Duroc, the Berkshire-Duroc cross, or the Duroc-Berkshire cross.

Pastures.—We cannot emphasize too strongly the importance of providing ample pastures for hogs. They cannot be raised at a good profit without it. Hogs should have good pastures every day of the year. The Station keeps from eight to twelve sows and our pasture system is about as follows: Four and a half acres in Bermuda sod in which are the hog houses, four and a half acres seeded in September to rape and red clover, four and a half acres in alfalfa, four and a half acres planted in September to wheat and crimson clover followed by sorghum and soy beans, two and a quarter acres each. In addition to these we plant peas in every acre of our corn and graze them off after the corn is harvested.

There are now grazing on our pea fields sixty head of very fine hogs, which we expect to market the latter part of January at a nice profit.

Quarters.—We have now under construction at the Station a modern hog house with concrete floors throughout and provided with various compartments in which to store feeds, to accommodate sows and pigs, and in which to conduct feeding experiments. There will also be a concrete dipping vat in connection with the building.

ROTATION.

With a hope of finding some system of crop rotation that will keep up the fertility of our Delta soils, can be practiced at a profit, and at the same time may be easily adopted by our Delta planters, we inaugurated at the beginning of this year a rotation experiment including almost everything from continuous cropping of cotton, to a seven year rotation, with oats one year, alfalfa three years, and cotton three years. Included in this work are 31 plats of 1-10 acre

each. The work, of course, has not advanced far enough to report results, but we hope to make these plats of land the most interesting and instructive on the Station, in the course of a few years. We are using no fertilizers in this work and it is our aim for these experiments to be continued indefinitely.

FERTILIZER EXPERIMENTS.

At the beginning of the year a series of fertilizer experiments was inaugurated on 46 plats with the expectation of running the tests for several years, and to give the plots the same fertilizer applications each year.

The land on which these tests are being made is fairly well surface-drained sandy loam soil. It is very uniform and had never before had an application of commercial fertilizer. It has grown nothing but cotton for as far back as we have any record.

Although no definite conclusions can be drawn from the results of one year's work, we give the following tables as the results of our first year's work for what it is worth.

The season was very dry during May and June, which was a very unfavorable condition for fertilizers.

Table I. gives results of plots fertilized with cottonseed meal, acid phosphate, and kainit singly, and in combination with each other as indicated in comparison with unfertilized plots. In making a check an average of plots 1 and 9 is used.

TABLE I.

Plot No.	Fertilizer Application per Acre.	Pounds seed cotton per acre, first picking.	Pounds seed cotton per acre, second picking.	Total pounds seed cotton per acre.	Increase due to fertilizer.	Value of increase at 4.5 cents per pound.	Cost of fertilizer per acre.	Value of increase over cost of fertilizer per acre.
1	Unfertilized	1333	250	1585	0	0	0	0
2	200 lbs. C.-S. Meal	1400	233	1633	101	$ 4.54	$ 2.50	$ 2.04
3	150 lbs. Acid Phosphate	1200	250	1450	−82	−3.69	1.05	−4.74
4	50 lbs. Kainit	1266	216	1482	−50	−2.25	0.32	−2.57
5	200 lbs. C.-S. Meal, 150 lbs. Acid Phosphate	1366	166	1532	0	0	3.55	−3.55
6	200 lbs. C.-S. Meal, 50 lbs. Kainit	1550	216	1766	234	10.53	2.82	7.71
7	150 lbs. Acid Phosphate, 50 lbs. Kainit	1550	133	1683	151	6.79	1.37	5.42
8	200 lbs. C.-S. Meal, 150 lbs. Acid Phosphate 50 lbs. Kainit	1533	216	1749	217	9.76	3.87	5.89
9	Unfertilized	1283	200	1483	0	0	0	0
$\frac{1+9}{2}$	Average of Unfertilized	1307	225	1532	0	0	0	0

Table II. gives results of test with lime alone and in combination with other elements.

TABLE II.

Plot No.	Fertilizer Application per Acre.	Pounds seed cotton per acre, first picking.	Pounds seed cotton per acre, second picking.	Total pounds seed cotton per acre.	Increase due to fertilizer.	Value of increase at 4.5 cents per pound.	Cost of fertilizer per acre.	Value of increase over cost of fertilizer per acre.
1	200 lbs. C.-S.Meal, 150 lbs. Acid Phosphate, 50 lbs.Kainit, 1000 lbs. Lime	1400	266	1666	150	$ 6.75	$ 5.12	$ 1.63
2	Unfertilized	1316	200	1516	0	0	0	0
3	1000 lbs. Lime	1166	200	1366	−150	−6.75	−1.25	−8.00

Our normal application is 400 pounds per acre consisting of 200 pounds of cottonseed meal, 150 pounds acid phosphate, and 50 pounds of kainit, and in Table III. once normal and twice normal is compared with no fertilizer.

TABLE III.

Plot No.	Fertilizer Application per Acre.	Pounds seed cotton per acre, first picking.	Pounds seed cotton per acre, second picking.	Total pounds seed cotton per acre.	Increase due to fertilizer.	Value of increase at 4.5 cents per pound.	Cost of fertilizer per acre.	Value of increase over cost of fertilizer per acre.
1	200 lbs. C.-S. Meal, 150 lbs. Acid Phosphate, 50 lbs. Kainit	1483	166	1649	100	$ 4.50	$ 3.87	$ 0.63
2	Unfertilized	1366	183	1549	0	0	0	0
3	400 lbs. C.-S. Meal, 300 lbs. Acid Phosphate, 100 lbs. Kainit	1533	200	1733	184	8.28	7.74	0.54

Table IV. gives results of varying amounts of cottonseed meal, acid phosphate, and kainit, other elements being normal, with no fertilizer.

TABLE IV.

Plot No.	Fertilizer Application per Acre.	Pounds seed cotton per acre, first picking.	Pounds seed cotton per acre, second picking.	Total pounds seed cotton per acre.	Increase due to fertilizer.	Value of increase at 4.5 cents per pound.	Cost of fertilizer per acre.	Value of increase over cost of fertilizer per acre.
1	200 lbs. C.-S. Meal, 150 lbs. Acid Phosphate, 50 lbs. Kainit	1533	183	1716	283	$12.73	$ 3.87	$ 8.86
2	Unfertilized	1233	200	1433	0	0	0	0
3	600 lbs. C.-S. Meal, 150 lbs. Acid Phosphate, 50 lbs. Kainit	1516	316	1832	399	17.95	8.87	9.08
4	200 lbs. C.-S. Meal, 150 lbs. Acid Phosphate, 50 lbs. Kainit	1533	133	1666	83	3.73	3.87	−0.14
5	Unfertilized	1350	233	1583	0	0	0	0
6	200 lbs. C.-S. Meal, 450 lbs. Acid Phosphate, 50 lbs. Kainit	1416	166	1582	−1	−0.04	5.97	−6.01
7	200 lbs. C.-S. Meal, 150 lbs. Acid Phosphate, 50 lbs. Kainit	1616	166	1782	333	14.98	3.87	11.11
8	Unfertilized	1283	166	1449	0	0	0	0
9	200 lbs. C.-S. Meal, 150 lbs. Acid Phosphate, 150 lbs. Kainit	1533	133	1666	217	9.76	4.51	5.25

Table V. gives results of test of nitrogen in the different forms with entire application at planting time, and with half at planting time, and half applied July 20th.

TABLE V.

Plot No.	Fertilizer Application per Acre.	Pounds seed cotton per acre, first picking.	Pounds seed cotton per acre, second picking.	Total pounds seed cotton per acre.	Increase due to fertilizer.	Value of increase at 4.5 cents per pound.	Cost of fertilizer per acre.	Value of increase over cost of fertilizer per acre.
1	400 lbs. C.-S. Meal at planting time	1333	350	1683	−150	−$6.75	$5.00	−$11.75
2	200 lbs. C.-S. Meal at planting time, and 200 lbs. C.-S. Meal on July 20th	1416	400	1816	−17	−0.76	5.00	−5.76
3	200 lbs. C.-S. Meal at planting time, and 80 lbs. Nitrate of Soda, July 20th	1916	300	2216	373	16.78	4.50	12.28
4	Unfertilized	1633	200	1833	0	0	0	0
5	160 lbs. Nitrate of Soda at planting time	1833	300	2133	300	13.50	4.00	9.50
6	80 lbs. Nitrate of Soda at planting time, and 80 lbs. Nitrate of Soda, July 20th	1733	750	2483	650	29.25	4.00	25.25
7	80 lbs. Nitrate of Soda at planting time, and 200 lbs. C.-S. Meal, July 20th	1433	523	1956	123	5.53	4.50	1.03

The land on which the above tests were made was broken flat on February 17th, the fertilizer applied, and the land bedded on April 28th, and planted on May 1st in Rublee cotton. Good stands were secured on all plots. The boll weevil appeared in considerable numbers in this cotton the last of July and damaged the crop approximately 15 per cent.

DRAINAGE.

Of the many propositions that confront our Delta farmers today that of drainage is the most serious. If cotton is to be grown under

boll weevil conditions it must be planted and a good stand secured early. This is impossible under conditions that now usually exist. Our lands must be drained if they are to be made warm and crops planted early in the spring.

The Station is doing considerable work in drainage, both in surface and tile. The entire Station farm is surface-drained by means of wide shallow ditches. The rows all run into these ditches and the surface water is quickly carried off.

Tile drainage.—During the winter of 1908 about 50 acres of the farm was tiled. The drains are doing good work. They have practically doubled the productive capacity of the land affected by them, but we believe that the tile is not doing what it should—due likely to havingbeen placed at too great a depth. The proper spacing and depth at which tile should be placed on Delta lands is a question of much importance, and we hope to begin work in the immediate future to determine this matter. We are now making plans to inaugurate a system of vertical tile drainage at the Station during the present winter, and will report results in due time.

PEANUTS.

The Station began some experiments in the spring with peanuts, which included time of planting, space of rows, and some fertilizer tests, but on account of failing in several attempts to get good stands, due to dry weather, our results are not deemed trustworthy and will not be published in detail. With the stands we were able to secure in the spacing test, best results were gotten from rows three feet apart and the hills about sixteen inches apart in the drill.

In the time of the planting test we got the best yield from the plot planted the first week in June.

We got no increase due to fertilizers. The land on which this test was made is a fertile sandy loam and the average yield on all the plots was 67 bushels per acre. The white Spanish peanut was planted in all the tests.

The peanut makes a most excellent free pasture for hogs, and the Station urges that more consideration be given this crop when planning crop rotations for hog pastures on Delta farms.

COTTON.

Since the boll weevil is now a reality on most of our Delta farms, cotton can no longer be grown at a profit under old time plantation

conditions. Cotton does not, however, cease to be an important crop, and to bear a most important relation to Delta farming.

It is only now that we realize that diversification and rotation are the foundation of all permanent agriculture and come to regard cotton as we should always have regarded it,—as a principal money crop, after the fertility of our soil has been kept up, and the farm made self-sustaining by other crops.

Yields.—We cultivated this year 48 acres in cotton and harvested 24,277 pounds of lint per acre. The season was very unfavorable for cotton all the way through. The continued wet weather during April prevented early planting and the long drought which followed made our stands very unsatisfactory. One-fifth of our cotton acreage was planted on April 26th, and the remaining four-fifths was not planted until May 1st, 2nd, and 3rd.

Boll weevils were found in fairly large numbers the last week of July and did considerable damage before the end of the season. In some of the fields as much as 15 per cent damage was done by the weevil, but in others the damage was not so great.

Of the 48 acres in cotton, six acres were in Rublee, 23 in Cleveland Big Boll, 12 1-2 in Columbia, 6 1-2 in variety tests, including 23 varieties and various other experimental cottons. The Rublee cotton is one inch in staple, the Cleveland Big Boll, 1 1-16 inches, and the Columbia, 1 3-16 inches.

With the exception of 3 2-5 acres of the land planted in Rublee cotton, none of the land was fertilized. The land that grew Rublee and Columbia was in cotton the previous year, the 23 acres that grew Cleveland Big Boll grew corn and peas, and the 6 1-2 acres on which the variety cotton grew was in oats followed by Mexican June corn the previous year.

Cultivation.—Although one of the main requisites for growing good crops of cotton is rich land, there is nothing that influences a cotton crop more than does cultivation. No rule can be laid down and followed in cultivating a crop. It must be varied to suit the season and no two seasons are alike. There are a few rules, however, that must be adhered to very closely if cotton is to be grown at a profit under boll weevil conditions. These are thorough and early preparation, early planting, and rapid cultivation.

We begin our preparation in the winter by plowing the land in beds, plowing as deep as we well can. The land is left in this shape until early spring, when we re-bed, making sure it is done long enough

before we are ready to plant for the land to settle and become thoroughly firm. This early preparation is very essential, more so now than ever, since the boll weevil is here, for, to make cotton profitably under the fire of the weevil, a good stand must be secured early, and this is impossible on poorly and freshly prepared land. We throw our beds up in good high shape, which insures good drainage and early warming of the soil.

We give our first cultivation as soon as possible after the cotton is up to a stand, with side-harrow attachments to double cultivators, or with single side-harrows. The hoes follow immediately behind the harrows thinning the cotton to a stand.

Our second cultivation is usually with the same harrow, or cultivator as is used in first cultivation and is done as soon as possible after the cotton is thinned. The cultivations are continued as rapidly as is necessary to keep grass and weeds in check and to conserve moisture. We use double cultivators with shovel attachments until the cotton is too large for double cultivators, after which we use a single cultivator such as the "Planet Junior," until the cotton begins to open. We advise late cultivation, particularly if the season is dry.

Spacing.—The proper spacing of cotton is a question of special interest to every man who grows cotton, and is a question we are asked hundreds of times every year. We tested at the Station this year three, three and a half, four, five and six foot rows. On all rows the stalks stood from 18 inches to 24 inches in the drill. The best yield was gotten from the three and a half foot rows, with second best from the three foot rows, third, from four foot rows, fourth from five foot rows, and sixth from six foot rows.

We expect practically a maximum infestation of boll weevils next year and under such conditions we expect to give special attention to spacing, both of the rows and the stalks in the drill.

Variety test of cotton.—In the following table is given a list of 23 varieties of cotton tested at the Delta Branch Station in the year 1911, with data which show results obtained from each variety. In this report is contained some valuable and interesting information, and it is hoped that every cotton farmer in the state, particularly those in the Delta will study carefully the showing made by the different varieties. In the column containing pounds seed cotton per acre at the first picking, will be found a key to the comparative early maturing qualities of the different varieties, a quality that seems to be very essential for a variety, if it is to be grown, at a profit under

boll weevil conditions. The conditions under which this test was made are similar to those existing over almost all the Delta and from this report the farmer should be able to get some indications of the varieties best suited to his conditions. Unfortunately there are no seed available of the "Express" cotton, the variety that took first place, but the Delta Station and others will likely have a few seed for distribution in another year or two.

Table VI.---Variety Test of Cotton.

Names of Varieties.	Date of first blooms.	Character of foliage.	Pounds seed cotton per acre, 1st pick., Sep. 30.	Pounds seed cotton per acre, 2nd pick., Nov. 2.	Total yield seed cotton per acre.	Yield lint cotton per acre.	Percentage of lint.	Length of staple according to Leland classification.	Character of lint.	Price of lint per pound middling grade.	Value of lint cotton per acre.	Value of seed per acre, at $18.00 per ton	Total value of lint and seed per acre.	% of stand secured	Rank as to money value
			lbs.	lbs.	lbs.	lbs.	%	INCHES.		cts.				%	
Rublee	Jun 27	Very light	1235	275	1510	498	33	1	Good, strong, even	9¾	$48.55	$9.10	$57.65	95	3
Broadwell's Double Jointed	Jun 28	Very light	1125	225	1350	445	33	5-8	Very poor, uneven	8¼	31.71	8.14	44.85	98	20
Covington-Toole	July 2	Very light	915	395	1310	484	37	1	Fairly good, and even	9¾	47.16	7.43	54.62	98	8
Truitt's Ninety-Day	Jun 29	Very light	1255	275	1530	489	32	½ to 5-8	Poor and uneven	8¼	40.34	9.37	49.71	98	14
Sproull	July 2	Very d'nse	580	330	910	282	31	1	Fairly good and even	9¾	27.50	5.65	33.15	80	23
Trice	Jun 26	Light	1390	225	1615	484	30	7-8	Fairly good and even	9½	45.98	11.08	57.06	97	5
Simpkins	Jun 29	Very light	1290	165	1455	480	33	½ to5-8	Poor in every respect	8¼	39.60	8.77	48.37	98	17
King	Jun 26	Very light	1285	200	1485	519	35	½ to 5-8	Poor in every respect	8¼	42.82	8.60	51.42	98	12
World's Wonder	Jun 28	Light	1080	380	1460	438	30	1 1-16	Good, strong, even	10¼	44.89	9.20	54.09	95	10
Dixie	July 1	Light	925	470	1395	446	32	½	Poor, undesirable	8¼	37.79	8.54	45.33	97	19
Rowden 116	Jun 28	Medium	1040	350	1390	463	33½	1 1-16	Very good	10 1-8	46.88	8.34	55.22	92	7
Money Maker	July 2	Light	860	345	1205	445	37	7-8	Poor and undesirable	8½	37.82	6.84	44.66	95	21
*a*Cook, from Exp. Station	July 1	Dense	1115	380	1495	538	36	½	Undesirable, any tr'd.	8¼	44.38	8.61	52.99	95	11
Cook, from Cook	July 1	Dense	985	315	1300	455	35	¾	Wasty	8¾	39.81	7.60	47.41	95	18
*a*Cleveland, from Exp. Sta.	July 1	Dense	965	330	1295	430	34	7-8	Very wasty and unev.	9½	40.85	7.78	48.63	92	16
Cleveland, from Cleveland	July 2	Dense	980	385	1365	455	33½	1 1-16	Fairly good and even	10 1-8	46.07	8.10	54.17	90	9
Triumph, from Wade	Jun 29	Dense	995	340	1335	480	36	1 1-16full	Good, strong body	10 1-8	48.60	7.70	56.30	95	6
Triumph, from Mebane	Jun 28	Dense	985	360	1345	510	38	1 1-8	Very good and even	10¾	54.82	7.51	62.33	93	2
Lone Star	July 2	Dense	830	375	1205	420	35	1 1-8 full	Good heavy body and staple	12	50.40	7.06	57.46	90	4
Express	Jun 28	Very light	1475	220	1695	474	28	1 1-8 full	Even, ex. heavy body	12	56.88	10.98	67.86	98	1
Sunflower	Jun 29	Light	755	270	1025	256	25	1 5-16	Good, silky and str'ng	17	43.52	6.92	50.44	95	13
Columbia	Jun 29	Dense	725	325	1050	315	30	1¼	Good body, strong and even	13½	42.52	6.61	49.13	92	15
Mississippi Silk	July 2	Light	540	250	790	189	24	1 7-16	Good body and staple	19½	36.85	5.41	42.26	95	22

a From Experiment Station, A. and M. College, Agricultural College, Miss.

The land on which this test was made is a tract of four and three-fifths acres of characteristic Deer Creek sandy loam soil, being only fairly well surface-drained, and not highly improved. It grew oats followed by Mexican June corn the previous year.

The land was broken flat the first week in March, put into beds four feet apart in April, and planted on May 1st. One row of each variety was planted in the order in which the varieties appear in the table, and in this order repeated five times. The planting was done in this manner to obviate any difference there might be in the soil. There was one-fifth acre planted to each of the varieties and our yields per acre are computed on this basis.

The cotton was planted just at the beginning of a long drought and as a result poor stands were secured of some of the varieties, particularly those varieties having large seed. The stand in no case, however, was so bad as to justify replanting.

This field of cotton was attacked by two broods of the cotton army worm, by the boll worm, and by the boll weevil, each of which did considerable damage to the crop.

Samples of lint cotton from each of the varieties were classed by both the Greenville Cotton Company of Greenville, Miss., and the McGee-Dean Cotton Company of Leland, Miss., and our valuations are made from information furnished by these people. The Experiment Station is greatly indebted to the cotton firms mentioned above for the assistance rendered by them.

AVAILABLE BULLETINS AND CIRCULARS.

The following bulletins and circulars of the Station may be had on request:

Bulletins.

No.

60—Value of Cotton Seed to the Farmer.
84—Report of Field Work at College Station for 1903.
90—San Jose Scale.
91—Inspection and Analyses of Commercial Fertilizers.
92—Beef Cattle.
93—Peach and Plum Culture.
94—Report of Work at McNeill Branch Station for 1905.
95—The Dairy Cow.
104—Inspection and Analyses of Cotton-Seed Meal.
107—Pork Production at the Delta Station.
114—Inspection and Analyses of Cotton-Seed Meal.
119—Report of Work at the Delta Branch Station for 1907 and 1908.
121—Experiments in Feeding Beef Steers.
122—Report of Work at the Holly Springs Branch Station for 1908.
125—Inspection and Analyses of Commercial Feeding Stuffs.
127—Inspection and Analyses of Cotton-Seed Meal.
128—Inspection and Analyses of Cotton-Seed Meal.
129—Sugar Cane for Syrup Making.
132—The Soils of Mississippi.
133—Inspection and Analyses of Commercial Feeding Stuffs.
135—Cotton 1909.
137—Inspection and Analyses of Commercial Feeding Stuffs.
138—Inspection and Analyses of Commercial Feeding Stuffs.
139—The Boll Weevil in Mississippi, 1909.
140—Cotton Diseases in Mississippi
141—Control of Diseases of Fruits, Flowers and Vegetables.
142—Inspection and Analyses of Commercial Fertilizers.
143—Inspection and Analyses of Cotton-Seed Meal.
144—Inspection and Analyses of Commercial Feeding Stuffs.
145—Inspection and Analyses of Commercial Feeding Stuffs.
146—Suggestions for Growing Home Fruits.
147—Apple Growing in Mississippi.
148—Inspection and Analyses of Cotton-Seed Meal.
149—Inspection and Analyses of Commercial Feeding Stuffs.
150—Inspection and Analyses of Commercial Fertilizers.
151—Inspection and Analyses of Cotton-Seed Meal.
152—Inspection and Analyses of Commercial Feeding Stuffs.
153—Inspection and Analyses of Commercial Feeding Stuffs.
154—Inspection and Analyses of Commercial Feeding Stuffs.
155—Recent Cotton Experiments.
156—Inspection and Analyses of Cottonseed Meal.
157—Report of Work at the Delta Branch Experiment Station for 1911.
158—Report of Work at McNeill Branch Experiment Station for 1907-1911.
159—Clearing Pine Lands.
160—The Cut Over Lands of South Mississippi.

Circulars.

Asparagus.
Blackleg.
Boll Weevil.
Insect Pest Law.
Underground Waters of Mississippi.
Hairy Vetch.

Address, AGRICULTURAL EXPERIMENT STATION,

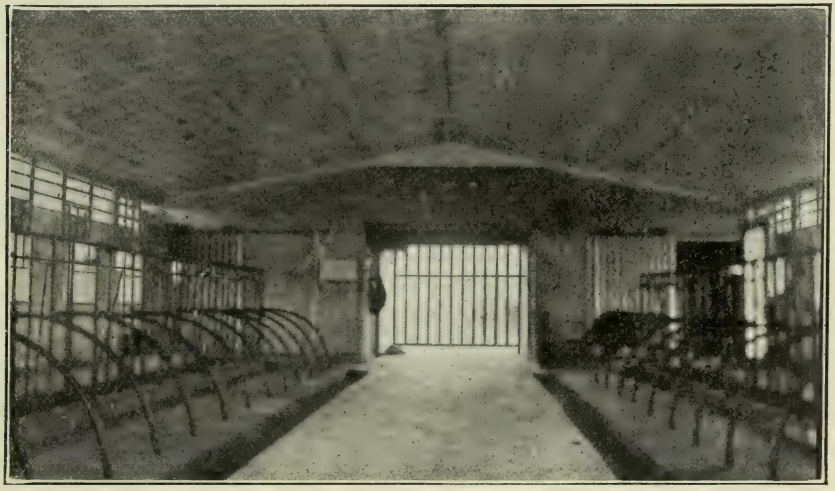
Agricultural College, Miss.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi.

BULLETIN No. 158.

REPORT OF WORK AT
McNeill Branch Experiment Station
For 1907 to 1911, Inclusive.

By E. B. Ferris.



INTERIOR OF DAIRY BARN.

AGRICULTURAL COLLEGE, MISSISSIPPI,

January, 1912.

TUCKER PRINTING HOUSE JACKSON MISS

Report of Work at McNeill Branch Experiment Station

For Years 1907 to 1911, Inclusive.

Introduction.—Originally it was planned to get out yearly reports of the work at this Station and this idea was carried out from 1902 to 1906, inclusive, but on account of a lack of funds for printing these bulletins and the importance of getting out publications on special subjects, these yearly reports have been omitted. It is hoped in this one bulletin to cover the work of these five years. The bulletins issued on special subjects have been on "Fertilizers," "Clearing Pine Lands," "Sugar Cane for Syrup Making," "Peanuts," and "Snap Beans." It is hoped soon, if the money is available, to issue similar bulletins on "Cabbage," "Irish Potatoes," "Sweet Potatoes," "Small Grain Crops," and "Dairying."

Clearing land.—Since the last report remaining stumps have been removed from all the land in cultivation and from a number of acres of pasture land, giving the station now nearly one hundred acres free from stumps. Besides, the most of the pasture land has been gradually cleared of logs, tree-tops and sprouts, so that a mowing machine may be run over it to keep down weeds and young sprouts. A good deal of this pasture land has been sodded to Bermuda grass while the rest of it is gradually being covered with carpet grass and lespedeza. A good part of the original pasture has been given a top dressing of raw phosphate rock. In 1911 about 220 additional acres of land adjoining that already used for pasture was fenced with four wires and is being used to pasture dairy cattle. The station has built up some pastures here at a moderate cost that compare favorably with the best acres in the state regardless of location.

Water supply.—The legislature of 1908 gave this station one thousand dollars for improving its water supply. This was not sufficient to contract for the boring of a deep well, for the best bid we had on a 4-inch well was two dollars per foot and we were reasonably sure of having to go deeper than 500 feet to find the water we wanted, and of finally having to buy machinery to pump such water when found. The only alternative was to do the boring ourselves and we were fortunate in having friends and neighbors sufficiently interested in the work to help it along. The Lacey Lumber Company at Carriere had just bored a deep well and lent the station their well-boring

machinery, while another neighbor lent a traction engine to furnish steam. With this outfit and the services of a man employed at two dollars per day, a two-inch test well was sunk 560 feet without striking water after the vein had been left at 100 feet. At the depth of 560 feet the 2-inch pipe broke off 440 feet beneath the surface and was pulled up, leaving 120 feet in the ground. Not having money to experiment further, a deep well was abandoned and a 6-inch pipe with 43 feet of strainer on the bottom was sunk 100 feet so as to develop the water that had been found between 43 and 100 feet. Into this 6-inch well was placed a deep well pump 95 feet underground and this pump was operated by a pumping jack run by a gasoline engine. The pump-house was made on one end of the milk-room and the shafting so arranged that the engine which runs the pump may also be used to run the churn, the separator, and the milk tester in an adjoining room. The supply of water has proved to be inexhaustible, the water being pumped from the well into a 10,000 gallon tank which is placed on a tower 40 feet high and from here is distributed in pipes all over the place, giving water not only for domestic purposes, but for fire protection as well, while in 1909 an acre of cabbage was irrigated from this well, which shows that it can be used for this purpose.

DAIRY.

The legislature of 1908 gave $1,000.00 for a dairy barn here and a like amount with which to buy dairy cattle. With the assistance of an expert from the Dairy Division of the U. S. Department of Agriculture, who furnished the plans and did considerable supervision of the work, one of the most sanitary dairy barns in the State was constructed. The barn accommodates thirty cows, has concrete floors and troughs throughout, has iron stalls and stanchions, and is thoroughly lighted, ventilated, and provided with water for flushing and keeping spotlessly clean. Attached to this cow-barn is a commodious feed-barn, an old implement shelter having been converted for this purpose. The floors of the two barns are continuous, both being of concrete, and they are under continuous roofs. The two rooms of this feed-barn will hold several carloads of concentrated feed and in addition the loft accommodates a number of tons of hay. The milk-room was built apart from the dairy-barn and one hundred yards away and is itself largely built of concrete on the inside and so arranged as to most economically house the separator, churn, sinks, milk tester and ice box. As stated, a single roof and foundation accommodates both dairy house and pumping station.

Twenty-two cows and heifers were bought in May of 1909 and until the last year an average of about eighteen cows has been giving milk the greater portion of the time. Recently several animals have been sold because they were poor milkers and also because we could not keep so many under present methods of handling the sales-fund money. It is now contemplated to sell out most of the grades and keep only a few registered cows with which to do experimental work only. This action will depend on the policy of the next legislature in regard to the branch stations.

The cows mentioned above as having been purchased have generally proved to be good individuals, several of them having given three gallons of milk per day for considerable periods of time and sometimes running up to four gallons, while, when well fed, they have averaged two gallons per day per cow. For the most of the time these cattle have been allowed to run on a seventy acre pasture in summer which in the beginning furnished little nutriment, but which has greatly improved due to the droppings from these cattle and the application of raw phosphate rock. Mention has been made of the additional land fenced for these cattle. In fall and winter these cattle have been grazed on velvet bean fields, rape patches, and fall sown oats, while during the rainy days of winter and throughout the early spring, such crops as cabbage stalks, turnips, collards and the like have been hauled out to them.

Experiments have been conducted to determine the value of rape and velvet beans as milk producers. Rape planted in September, after two other crops had been grown on the same land, was grazed off in November and proved to be worth ten dollars per acre as a milk producer; it sprouted out a second time, but the second crop was not so good as the first and its value was not determined. Velvet beans planted as a catch crop in corn proved to be worth eight dollars per acre as a milk producer. This was not a maximum crop of beans, for they had been planted in May, too late to mature the heaviest yield of beans, but by being planted this late, they interfered little with the growth of the corn which was gathered in August before the beans had so wrapped it up as to make harvesting next to impossible. Except the cottonseed meal, the most of the feed consumed by these milk-cattle has been grown on the Station. In 1910, although there had been no money appropriated for a silo, the need of one was so urgent that a stave silo 12 feet in diameter and 24 feet high was built and for the past two years has been filled with silage made from such crops as corn, soy beans, beggar weed, and various sorghums, but mostly

with corn, which of all other crops has proved by far the best for silage according to experience here. A hand cutting-machine already here and a four-horse-power gasoline engine were used to cut up this silage and it was surprising the rapidity with which the work was done. Without this silage, dairy work here would have been greatly handicapped, for experience has shown that the silo is even more important here than in other sections of the country, because we have too much rain to make the saving of dry forage profitable, experience here having shown that it is next to impossible to save the corn-stalks as stover, and that rats and weevils cause great loss in the stored grain. The silo enables one to save the entire corn crop, every particle of which will be greedily eaten by the cattle, while the lossage due to rats and weevils will be entirely eliminated. This silage can be housed at no greater expense for buildings than would the corn and stover from an equal acreage, for while large quantities of water will be contained in the silage, this will be more than offset by the greater density to which it packs.

In handling these cattle every effort has been made to conserve the manure from them and to this end a number of paddocks have been fenced off for penning the cattle at night so as to get full benefit from all solid and liquid excrement. At the same time these paddocks are made to furnish valuable grazing for the cattle by being planted to a number of different crops as the cattle are taken from one and penned on another. The sandy nature of the soils here makes it possible to graze cattle even on cultivated land for the greater portion of the time and the mild winters makes it unnecessary to house these cattle at any time. By so handling these cattle a number of acres of land has been highly improved here and give maximum yields of any crop grown on them.

An unlimited market for dairy products has been found not only in New Orleans, but in the smaller towns and cities accessible to McNeill and this territory generally. For a considerable time the station sold its product as cream to ice-cream makers at Hattiesburg and Laurel, but for the past year has sold milk entirely to milk companies in New Orleans. This milk and cream is sold entirely on a butter fat basis and nets to the producer from twenty cents per gallon in summer to twenty-five cents in winter for milk from ordianry grade Jersey cows. This would mean approximately fifty cents per pound for butter fat which is considerably higher than the prices prevailing in the North, and it would seem that where all conditions, except the matter of good pastures, were so favorable to this section, that

it might finally be developed into an ideal dairy country. There certainly is no country where the water supply is much superior to that here, nor where the natural advantages for producing sanitary dairy products could be greatly improved upon.

FRUITS.

Up to the present time this Station has continued to grow quite a variety of vegetables and a few fruits, growing a sufficient quantity of the most promising kinds to be able to tell something about the business from a commercial standpoint. It requires considerably more time and money to do this than would be necessary to do the work strictly from an experimental standpoint, and the chances are that since all sales-fund money has to be returned to the State treasury and cannot be spent here as heretofore, this commercial work will have to be discontinued.

Strawberries.—The original planting of berries here did remarkably well and several profitable crops were marketed from a single setting of plants, but later plantings, for several reasons, have never been grown so successfully. In 1906 seven plats of land of 1-16 acre each were fertilized as follows: one-half the amount being applied at the last cultivation in the fall and the other half at the end of the picking season in the spring:

Plat.	C.S.M.	A.P.	Kainit.	Yield in Quarts. 1907.	1908.
1	256	256	128	696	1264
2	512	512	0	624	1136
3	128	128	0	440	1184
4	256	512	0	616	1040
5	256	256	0	504	888
6	0	0	0	256	832
7	572	256	0	624	1360

In the late fall of 1908 two acres of land were set to Lady Thompson berries, and small plats of one-twentieth acre each were set to ten other promising varieties of berries. The plants had all been bought in North Carolina and the land on which they were planted was in excellent condition. They all lived and were growing off beautifully until the first warm days of the following summer when the plants began to show a parched condition and finally to die. Before the end of the summer more than two-thirds of these plants were dead and the rest appeared to be in a dying condition. The land had been

cultivated thoroughly throughout the entire spring and summer and it could not have been anything else than disease that killed them. We diagnosed the trouble as strawberry rust, plowed up the plants not actually dead, and abandoned the berry crop for the time being, hoping thereby to starve out the fungous that caused the trouble.

In the fall of 1910 about an acre of Klondyke berries was set out and lived well through the first summer and gives promise of good yields during the coming season. Experience here has gone to show that this crop should either be grown on new land or on old ground where crab grass seeds have been destroyed either by the growing of velvet beans or by allowing the land to lie out long enough to get rid of this great pest.

Peaches.—The one hundred peach trees used to test the fertilizer requirements of this crop were seriously attacked with San Jose scale and with nematode root disease during the earlier part of 1906 and the trees were thoroughly sprayed with the lime-salt-sulphur mixture during the winters of 1905-06-07, but on account of the frequent rains the applications were washed off so badly that they did little good and the idea of trying to save them was abandoned, and after half of them had been killed outright, the rest were dug up in 1907 and burned. So with the 1500 peach and plum trees that had been put out for commercial purposes, the scale became so bad during 1908 and the earlier part of 1909, that the entire orchard was pulled up by the roots and destroyed.

Oranges.—During the last days of January, 1908, four varieties of citranges furnished by the U. S. Department of Agriculture were set out and have since grown fairly well and bore just a little during the year of 1911. A year later several varieties of lemons and some Satsuma oranges were set out. All the lemons died, while all the Satsumas lived and bore several oranges per tree during 1911.

The legislature of 1910 gave $250.00 for an experiment with oranges here and in the year of 1911 some 250 trees of several varieties, but largely Satsumas, were set out. With these trees it is expected to test the merits of several promising varieties, and likewise the possibilities of growing the best varieties on a commercial scale, and to test the relative merits of high-priced nursery stock, or trees 5 to 7 feet high, as compared with lower-priced stock, or trees ranging in height from one to seven feet; also it is expected to test the benefits to be derived from subsoiling the land with dynamite before planting the trees, this last to be done in conjunction with the DuPont Powder Company.

The only other fruits now being grown here, out of quite a large list that was originally planted, are four varieties of grapes, some scuppernongs, figs, pears, mulberries, and chestnuts, with a few pecans that are just beginning to bear.

VEGETABLES.

Asparagus.—The station has six plats of asparagus of one-sixteenth acre each that have been fertilized the same way for a number of years, the results of this work having been published in reports up to 1906, and the following table gives them for the years 1907 to 1910 inclusive:

Plat.	Cottonseed Meal.	Nitrate of Soda.	Acid Phosphate.	Kainit.	Yield in Lbs. of Asparagus.			
					1907.	1908.	1909.	1910.
1	256	128	400	160	840	1608	1312	963
2	256	128	200	160	876	1684	1356	1032
3	128	64	480	104	844	1700	1304	1180
4	256	128	400	0	828	1552	1224	1048
5	512	256	800	336	920	1780	1284	1224
6	0	0	0	0	712	1348	852	576

The above table gives quantities of fertilizers used, calculated in pounds per acre, and merchantable asparagus cut daily and likewise calculated in pounds per acre. In 1907 this asparagus was cut between March 18th and May 1st; in 1908 between March 16th and April 22nd; in 1909 between March 22nd and May 5th; and in 1910 between March 23rd and April 23rd. The asparagus from these plats and from additional plats devoted to the crop has been sold at fairly remunerative prices, largely on the Chicago market.

Cabbage.—The station has grown or has attempted to grow cabbage every year since it was established, usually planting both fall and early spring crops and conducting tests with fertilizers in addition to growing the crop on a commercial scale. Generally the work with fertilizers under cabbage has proved unsatisfactory, due to the fact that the crop requires a more fertile soil than may usually be had by the simple addition of commercial fertilizers to the natural soil, and the introduction of animal manures tends to make the result obtained with commercial fertilizers unreliable.

In 1908 eight plats of land as nearly uniform in composition as we could get were set aside for conducting four simple fertilizer tests

with cabbage, all the tests being made in duplicate. This cabbage did finely during the cooler portion of the spring, but poorly during the warmer portion and the results were not very satisfactory. The following table gives an average of these results calculated in pounds per acre of both fertilizers and headed cabbage cut ready to ship:

Plat.	Nitrate of Soda.	Cottonseed Meal.	Acid Phosphate.	Kainit.	Cabbage.
1.	64	120	480	0	8256
2.	0	240	480	210	8816
3.	128	240	480	0	6528
4.	128	240	480	240	6224

In a small way the Station has grown fall cabbage successfully for several years and in August of 1909 went into the work a little more extensively. Land where strawberries had become diseased and had been plowed up was thoroughly prepared some weeks in advance of planting the cabbage and on August 25th was laid off into three-foot rows, these were two-furrowed, fertilized with acid phosphate and cottonseed meal; this was harrowed in and the beds completed. These rows were then harrowed down to where they were only slightly higher than the average of the land, when they were opened with a hand plow and Charleston Wakefield cabbage seed were sown by hand on August 27th and covered with garden rakes. The land was then rolled to bring the moisture to the surface and this was followed by a weeder to make a light dust mulch. One and one-quarter acres were planted in this way and the seed soon came up to a perfect stand. On October 8th enough plants over and above a stand were taken from the original planting to set out one and three-fourth acres additional land and while the replants never did so well as the others, those on the best land made good yields. We began cutting this cabbage on December 9th and continued up to March 11th, when from the three acres had been sold about 294 crates for shipper's net returns of about $340.00. Considerably more then half of this cabbage was produced on the one and one-fourth acres originally planted. There is considerable demand for cabbage on the markets of Southern cities just after Christmas and we believe the growing of the crop for this market would prove profitable in this section. The winter of 1909-10 was one of the coldest we have had and yet not one cabbage was killed here in the open field. Again in the fall of 1909 a similar acreage was devoted to fall cabbage, but the seed were not planted until September and the plants being young were damaged consid-

erably by an early cold spell. The crop, however, did fairly well though not nearly so well as did the crop preceding it.

Irish potatoes.—Irish potatoes have been grown here every year and many tests made with them. A special bulletin is being prepared giving this work in detail for several years past and we will have very little to say on the subject in this short report. On the whole the Irish potato has not proved a very profitable crop here, it requires a rich soil, is badly attacked by the Colorado potato beetle, decays quickly when dug or when left in the grounds after maturity, besides the cost of seed and fertilizer makes it a very expensive crop to grow.

In 1907, to further test the value of potash fertilizers for potatoes on a somewhat larger scale, two tracts of land of about one-half acre each were fertilized; one at the rate of 250 lbs. each of acid phosphate, cottonseed meal, and kainit and the other with the same quantities of acid phosphate and cottonseed meal but with no kainit. The first named plat yielded at the rate of 57.2 bushels of potatoes per acre and the other, with potash left out, at the rate of 62 bushels per acre. These same plats were planted to corn following the potatoes and the potash plat made at the rate of 31.2 bushels of corn per acre, while the plat without potash made at the rate of 30.3 bushels per acre.

Other work with potatoes in 1908 was to test the effect of covering the seed when dropped in the drill with sugar cane bagasse before covering with dirt as compared with an equal area covered with soil alone. The ground used was the same as had been used the year before to make the fertilizer test just mentioned. The result was that the bagasse greatly retarded the sprouting of the potatoes and they did not make anything like so well with it as without it, the yield on the bagasse plat being only at the rate of 37 bushels of merchantable potatoes per acre, while the yield on the plat without the bagasse was at the rate of 82 bushels per acre.

Beans.—In 1907 nineteen plats of land almost perfectly level, as nearly uniform in composition as was possible to get and of known history so far as previous cropping and fertilization was concerned. were set aside for a complete test with fertilizers under beans. This land was thoroughly prepared and fertilized in nine different ways. each test being made in duplicate, while the nineteenth plat was used as a check and was not duplicated. Unfortunately the beans planted on these plats did not germinate well, were replanted, and still no stand was obtained and the experiment had to be abandoned for the time being. All plats were planted to another crop without additional fertilizer and in 1908 the same plats were again fertilized in the

same way and again planted to beans, this time a perfect stand being obtained and apparently reliable results secured. The following table gives an a verage of these results calculated in pounds of fertilizers and beans to the acre:

Plat.	Cottonseed Meal.	Nitrate of Soda.	Acid Phosphate.	Kainit.	Snap Beans.
1.	200	100			5180
2.			500		2890
3.				500	2720
4.	200	100	500	200	4680
5.	200	100	500		5540
6.	200	100	250		5140
7.	100	50	500		3950
8.	200	100		200	4540
9.	50	25	125	50	3800
10.	0	0	0	0	2240

Beans have been grown here every year as a commercial crop and have proved one of the most reliable of truck crops. It is a crop that can be grown at a minimum expense for seed and fertilizer, occupies the ground a very short time, and does remarkably well on unimproved lands. The crop is being grown extensively by local truckers and with sweet potatoes furnishes the most reliable money crop our people can grow. In fact the two crops are easily grown the same year on the same land and give handsome returns per acre.

STAPLE CROPS.

Cotton (*fertilizer test*).—Cotton has proved one of the most reliable crops for conducting work with fertilizers, or, at least, did until after the coming of the boll weevil, since which time it has been almost impossible to grow it at all at a profit. Really, so far as classing cotton as a crop to be recommended for this particular section, we have always regarded it as being inferior to many other crops and it has been grown here largely because it is easily marketed and a ready money crop. Experience at this station has shown that during the summer months when cotton is fruiting there is entirely too much rain in this region which is so close to the Gulf Coast and that it does not put on the fruit here that may be expected a few miles farther north or west. Still with all this our most reliable results with fertilizers have been obtained with the crop. In 1905 sixty plats of land of one-twentieth acre each were set aside for permanent work with fertilizers under

cotton and corn. These plats are located on soil as nearly uniform in composition as possible, practically level, and typical of the vast body of pine lands in South Mississippi. Thirty of these plats are planted each year to cotton and thirty to corn, cowpeas being grown as a catch crop in the latter, and the two crops rotated in this way. Each plat has received the same fertilizer since the experiment began and only twelve kinds and combinations of raw materials have been tried, the work with each crop being conducted in triplicate, and the plats so distributed as to do away as nearly as possible with variations in yield due to inequalities of the soil. At the same time fertilizer work has been conducted with cotton and corn on eight plats of land one-twentieth acre each located on what is known as the parked area, this work being done in triplicate. The table following gives the results of this work with cotton from 1906 to 1911 inclusive:

Fertilizer calculated in pounds per acre.								Yield of Seed Cotton per acre.					
Number of Plat.	Cottonseed Meal.	Acid Phosphate.	Kainit.	Ground Phosphate Rock.	New Jersey Marl.	Raw Ground Bone.	Lime and Acid Phos. Mixture. (Reverted P_2O_5.)	1906.	1907.	1908.	1909.	1910.	1911 *a*.
1	0	0	0	0	0	0	0	480	220	110	153	20	30
2	100	0	0	0	0	0	0	760	436	376	400	90	63
3	0	100	0	0	0	0	0	800	514	744	480	366	166
4	0	0	100	0	0	0	0	620	300	274	186	34	8
5	100	100	0	0	0	0	0	1060	616	644	513	326	292
6	100	100	100	0	0	0	0	860	640	693	520	306	300
7	200	100	0	0	0	0	0	1040	756	684	620	306	370
8	100	200	0	0	0	0	0	1000	666	636	480	254	340
9	100	0	0	0	500	0	0	620	420		360		140
10	100	0	0	100	0	0	0	840	510		520		220
11	0	0	0	0	0	165	0			720			
12	100	0	0	0	0	0	400			680		460	
13	100	100	0	Land parked by				1540	1120	920	624	180	490
14	100	100	100	cattle winter 1902-03.				1485	1090	870	633	170	510

a All applications of fertilizers doubled in 1911.

Cotton (*variety test*).—In 1907 the same land was used for testing varieties of cotton that had been used for this work the year before. This was fertilized about the first of April with a mixture of two parts

acid phosphate and one part cottonseed meal, at the rate of 300 lbs. per acre, thoroughly prepared, and nineteen varieties of cotton planted on April 25th. In order to lessen the variation in yields due to inequalities of the soil each variety was planted in a single row and these rows repeated as often as it was possible. There were 76 rows so that each variety had four different rows scattered over the entire patch. This cotton was gathered in two pickings, on Sept. 1st and Oct. 3rd, and total yields of the several rows averaged and given as the result of that variety. The yields calculated in pounds of seed cotton per acre were as follows: Cleveland Big Boll, 970; Hawkins' Extra Early Prolific, 840; Peterkin's Improved, 770; Cook's Improved, 760; Imperial Big Boll, 750; Russell's Big Boll, 680; Sunflower, 670; Toole's Improved, 660; Hagaman, 640; Southern Hope, 640; Hunnicutt's Big Boll, 540; Lewis' Prize, 540; Floradora, 530; Texas Wood, 525; Peterkin, 500; Pride of Georgia, 500; Strickland, 450; Culpepper, 100.

In 1908 and 1909 the land that had been used for work with varieties of cotton was taken to conduct a test to determine the possibility of growing cotton every year on the same land and of keeping up the supply of humus and nitrogen by growing winter legumes like vetch and burr clover, so in the fall of 1908 this land was planted to vetch at the last picking of the cotton, but without plowing up the stalks. This vetch came up to a perfect stand and grew off luxuriantly, making an immense growth of vine. The following spring we had great trouble in preparing a good seed bed for the succeeding crop of cotton, as in order to let the vetch reseed itself we had to leave a part of the middle with the plants growing thereon stand for several weeks before breaking and it was impossible with the plows that we had to use under the circumstances to get a good seed bed on the middle actually plowed. Even when left this way to reseed itself, this vetch failed to mature any seed and the land had to be reseeded the following fall. The second crop made an even more thrifty growth than the first, but it was alike impossible to prepare a good seed bed for the succeeding crop of cotton and the vetch again failed to reseed itself. Burr clover was tried this last year, but made no such growth as the vetch, though we believe it would have reseeded itself better; it interfered less with the succeeding crop by maturing its seed earlier, but it is nothing like so easy to grow here. This brought us up to the coming of the boll weevil in the fall of 1909 and it was soon apparent that it would be folly to attempt this experiment further on account of the late start such cotton would necessarily get.

In 1910 the boll weevil having reached us the previous September, four varieties of cotton were planted in alternating rows over the above mentioned vetch patch, the vetch itself having been turned under earlier with no regard to letting any of it stand to make seed. The amount of organic matter turned under, together with the succeeding dry weather gave a very poor seed bed and the cottonseed planted did not come up promptly. In fact, these seed did not germinate until after the tenth of May when a good rain came. No effort was made in growing this cotton to catch the first weevils nor to pick up the squares, but cultivations were frequent and the cotton grew off rapidly. These four varieties gave yields as follows, calculated in pounds of seed cotton per acre: Triumph, 231; Columbia, 243; Cleveland Big Boll, 309; and Simpkins, 380.

In 1911, 2.4 acres of land was selected for conducting variety tests with cotton. About half of this land had grown varieties of cotton the year before, while the other half had grown corn and velvet beans. The half heretofore grown to cotton was naturally much more productive soil than the half previously planted to corn and velvet beans, but was more on the order of bottom land and not so perfectly drained. All this land was laid off in 4.5 foot rows in January and bedded. In March it was fertilized with a mixture of acid phosphate and sulphate of ammonia at the rate of 400 pounds of acid phosphate and 66 pounds of sulphate of ammonia per acre and rebedded. These beds were dragged down almost level about the first of April and twenty varieties of cotton planted April 6th, each variety occupying a single row and this being repeated as often as was necessary to plant all the land. This was done to do away as nearly as possible with variations in yield due to inequalities of the soil, for while the more level and lower portion of the patch was naturally the better land, experience showed that the upper and more rolling half made much the better cotton.

There were seventy-two rows in the field so that there were four rows each of the first ten varieties given below and three rows each of the others, each row being one-thirtieth of an acre. The variety, Ashcraft's Double Jointed Snow Bank came after the other varieties were planted and was given two rows at the opposite side of the patch from where planting was started. With the exception of the Sproull cotton, these varieties all came up to nearly a perfect stand, but on the lower half of the plat, where cotton had previously grown, a great deal of the young cotton died and in reporting results we give the calculated yields as gathered and the calculated yields figured on the basis of a perfect stand.

Experience with this cotton convinces us that in this instance the rows were too wide for the best results, as the cotton never grew tall enough, except on the bottom land, to reach anywhere near the middle of the rows. This cotton was thinned to about twenty-four inches in the drill and we noted few if any more bolls on the stalks having, on account of a poorer stand, a greater distance in the drill. When this cotton was about ready to put on squares, which was the latter part of May, we began going over it once or twice a week catching the boll weevils and this was continued for almost a month when there were so many forms that the process of looking into each square to find the weevil was too laborious and the method of catching the grown weevils gave place to the process of picking up squares. We were able to pick up these squares only about twice when daily rains interfered, sometimes washing the fallen squares entirely away and sometimes leaving the freshly plowed land too soft to hold up the hands who did the picking. In all 145 weevils were caught from this patch and several hundred squares were picked up. After the continuous spell of wet weather we were never able again to gain control of the weevils and had to let them run their course.

A great many bolls were set on this cotton and at the first picking it looked as if three-fourths of a crop would be made in spite of the weevil and adverse weather conditions, but a great many bolls more than half grown were later punctured and failed to open at all. In the following table the yield of seed cotton calculated in pounds per acre is given for the two pickings, also total yield calculated on the basis of a perfect stand, the stalks having been counted on each row and the percentage of a stand determined:

	NAME OF VARIETY.	Fraction of Acre in Test.	Pounds Seed Cotton per acre, Aug. 22 (cal.).	Pounds Seed Cotton per acre, Sept. 15 (cal.).	Total actual Yield per acre (calculated).	Yield per acre based on perfect stand (cal.).
1	Lone Star	4-30	263	150	420	524
2	Triumph, from Station	4-30	296	150	446	518
3	Triumph, from Wade	4-30	262	154	416	526
4	Cleveland Big Boll	4-30	307	169	476	580
5	Cook's Improved, from Cook	4-30	240	210	450	522
6	Cook's Improved, from Station	4-30	172	154	326	466
7	Trice	4-30	435	128	563	770
8	Rowden	4-30	188	128	316	464
9	Sproull	4-30	101	128	229	434
10	Broadwell's Double Jointed	4-30	405	105	510	662
11	King	3-30	385	95	480	584
12	Truitt's 90 Day	3-30	380	150	530	588
13	Money Maker	3-30	240	140	300	432
14	Rublee	3-30	240	135	375	422
15	Covington-Toole	3-30	170	160	330	358
16	Dixie	3-30	245	150	395	452
17	World's Wonder	3-30	350	120	470	504
18	Columbia	3-30	240	125	365	650
19	Sunflower	3-30	270	115	385	388
20	Barber's Big Boll Prolific	3-30	270	105	375	478
21	Ashcraft's D. J. Snow Bank	2-30	375	250	625	625

Test with seed treated for boll weevil.—During the spring of 1910 the Texas Seed Company of Houston, Texas, sent here for trial two samples of treated cottonseed claiming for them immunity against the boll weevil. These seed were not received in time to plant them very early and a drought during April and early May made it impossible to get them up before the middle of May. They were planted along with untreated seed and the only difference noted between the treated and untreated seed was that the treated seed were longer germinating, apparently due to the repellant power to water of the substance with which they had been treated. No effort was made to catch the weevils nor to pick up the squares, but the cotton was cul-

tivated at frequent intervals and grew off rapidly. The cotton made a tremendous growth of foliage but the weevils destroyed all the forms on treated and untreated seed alike and the stalks were finally pulled up and destroyed without maturing enough bolls to be worth picking.

Time of planting.—In 1911 four plats of land of one-tenth acre each, the same that had been used to test the treated and untreated seed, were selected to test the time of planting cotton in its effect upon the control of the boll weevil. This land was of uniform composition and some of the best at the Station. It was thoroughly prepared and fertilized some time in advance of planting the seed and Triumph cottonseed bought of T. W. Wade were planted at intervals of two weeks until the four plats were planted. These seed came up promptly and in every instance to perfect stands and made unusually large stalks. Weevils were caught from May 20th to June 20th and squares were picked up about twice when daily rains made it impossible to continue the work. The yields calculated in pounds of seed cotton per acre were as follows: Planted April 1st, 278 lbs.; April 15th, 289 lbs.; May 1st, 55 lbs.; May 15th, 0 lbs.

Several other tests were made in 1911 to study methods of control of the boll weevil, but on account of extremely wet weather after the middle of June, these results were rendered unreliable and they are not reported. The growing of cotton here has received a serious blow from the coming of the boll weevil and in 1911, so far as we are able to find out, the only cotton planted within a radius of twelve miles of McNeill was that grown on this Station and such cotton as was grown here had to be hauled sixteen miles north to get to a gin and ours were among the few bales that were ginned even there.

Corn (*fertilizer test*).—Corn has been used every year along with cotton for conducting tests with fertilizers, and the reader is referred to paragraph on fertilizers for cotton to get the details as to the way the same work has been carried on for corn. While we have not regarded the results with corn as being so reliable as those with cotton, especially before the appearance of the boll weevil, they are nevertheless valuable and appear in the table following, the plats used having been one-twentieth acre each in size, the work done in triplicate, and the fertilizers applied and the yields of slip-shucked ears obtained calculated in pounds per acre:

Number of Plat.	Fertilizers Calculated in lbs. per acre.							Slip-shucked Ears in lbs. per acre.					
	Cottonseed Meal.	Acid Phosphate.	Kainit.	Ground Phosphate Rock.	New Jersey Marl.	Raw Ground Bone.	Lime and Acid Phos. Mixture. (Reverted P_2O_5).	1906.	1907.	1908.	1909.	1910.	1911 *a*.
1	0	0	0	0	0	0	0	1051	153	66	Corn destroyed by worms.	560	793
2	100	0	0	0	0	0	0	1699	740	446		860	1406
3	0	100	0	0	0	0	0	2037	1380	846		840	1880
4	0	0	100	0	0	0	0	1339	713	173		520	1072
5	100	100	0	0	0	0	0	1886	1200	1073		1220	1792
6	100	100	100	0	0	0	0	2059	1333	1066		1280	1832
7	200	100	0	0	0	0	0	1944	1466	1200		1360	2000
8	100	200	0	0	0	0	0	1807	1306	860		1380	1712
9	100	0	0	0	500	0	0			600		1020	
10	100	0	0	100	0	0	0			1073		1400	
11	0	0	0	0	0	165	0	2094	1526				
12	100	0	0	0	0	0	400	1900	1473				2020
13	100	100	0	Land parked by cat				2630	2000	1800		2280	1840
14	100	100	100	tle winter 1902-03.-				2390	1760	1600		2120	1780

a All applications of fertilizers doubled in 1911.

Corn (*variety test*).—In 1907 five varieties of corn were planted in a test here, but this corn did so poorly and was blown down so badly that records of yields were not kept. In 1910 twelve varieties of corn were planted here on land where cabbage had grown the previous winter and Irish potatoes the previous spring. These varieties were all planted on June 7th and gathered on October 17th with results as follows, calculated in bushels of corn per acre: Mexican June, 37.7; Berry's Early Breadfield, 31.0; Cocke's Prolific, 31.0; Native Grown Corn, 37.7; Iowa Silvermine, 41.0;Wallace's Favorite, 37.7; Yellow Dent, 31.0; Gold Standard, 29.1; Pride of Nishna, 31.0; Boone County White, 42.9; Diamond Joe's White, 39.4; Reid's Dent, 37.7. The last eight varieties in the list were purchased of the Ratekin Seed House, Shenandoah, Iowa.

In 1911 six varieties of corn were grown largely with a view to finding a good yielder and at same time a corn more resistant to weevils than the varieties heretofore grown here. This corn weevil is almost as great a pest here as the cotton boll weevil, frequently destroying

the corn in the fields where it matures early and is left in the field until frost, and always greatly damaging the corn grown with velvet beans, where it is practically impossible, as ordinarily grown in this section, to gather the corn before the velvet bean vines are killed by frost. Even when housed, the corn here is practically ruined by weevils before the succeeding summer unless it is repeatedly treated with carbon bisulphide, and in order to make this effective, very close cribs are required and the poison has to be used repeatedly.

Two very hard corns were bought of the Steckler Seed Co., of New Orleans, as being weevil resistant, but when planted here they proved almost as worthless as the average sugar corn and did not make enough corn to be worth gathering. They were the "Yellow Canada" and "White Flint". These two varieties were grown beside "White Corn" from Sam H. Shaw, Hairston, Miss.; Florida Flint Corn from E. B. Anderson, Marion, Ala.; Mosby Prolific from J. A. Wade, Alexander City, Ala.; and Cocke's Prolific from T. W. Wood and Sons, Richmond, Va. As stated the two varieties from New Orleans did not make anything; the Shaw corn made 28.0 bushels per acre; the Mosby corn, 33.0 bushels per acre; the Cocke's Prolific, 34.0 bushels per acre; and the Florida Flint, 37.5 bushels per acre.

When harvested these corns had been damaged by the weevil to a considerable extent, though the Florida Flint had been damaged to a considerably less extent than had the others. After gathering these varieties, they, with Blount's Prolific and Hasting's Prolific were set aside here in the office for several weeks when a final examination showed that all except the Florida Flint had been very badly damaged by the weevils and that, while they had attacked this variety somewhat, it was in far better condition than any other variety.

Except for the corn weevil this section has many superior advantages for growing corn and some of the heaviest yields of corn ever reported have been grown on the soils of South Mississippi similar to these here. Another drawback to corn-growing here has been the frequent showers of summer and early fall, making it impossible to save the immense quantity of forage that this crop produces along with the grain. Experience here has been that it is practically impossible to save this forage on account of these rains in any other way than by a silo and this makes the silo of particular importance here. This excessive rainfall contributes to the growing of extremely heavy crops of corn, especially the stalk and fodder, which makes it all the harder to cure as stover and all the more valuable to save as silage. These summer and fall showers do not interfere at all with the saving

of the silage for they are usually of very short duration and merely wet the stalks enough to make them keep the better in the silo.

The growing of corn along with velvet beans, both planted very early in the spring, is practiced in this country to a large extent and furnishes very valuable pasture for the cattle in fall and winter, but the weevil destroys more than half the value of this corn before it is harvested or gathered by the live-stock and this station has practiced the plan of planting the corn very early in March and the beans from six weeks to two months later. This gives an opportunity for gathering the mature corn in August before the vines so thoroughly enwrap it that it cannot be economically harvested and letting the beans then grow on undisturbed until frost. This is done at the expense of the beans, but saves more in the value of the corn than in the loss of the beans. This combination of corn and beans builds up the land very rapidly, does away with the necessity for purchasing nitrogenous fertilizers and, by reason of the immense amount of rotting organic matter left on the land from the beans, makes it possible to substitute raw phosphate rock for acid phosphate at a cost one-fourth as great for the phosphorus actually added.

In 1911 an experiment was conducted here to test the value of three forms of nitrogen under corn. These three forms were Nitroline containing 8.29 per cent of nitrogen, Ammoline containing 2.58 per cent of nitrogen, and ordinary cottonseed meal. Sufficient quantities of each of the three carriers of nitrogen were used to furnish the same amount of this material and were mixed with the same quantity of acid phosphate. Four plats of one-twentieth acre each were used for each combination of fertilizer and these plats were distributed about the land so as to do away as nearly as possible with variations in yield due to inequalities of the soil.

This corn was planted June 12th and harvested for silage on September 13th and gave yields as follows, averaged and reported in pounds of silage corn per acre, the corn having reached the stage where it had begun to dent; 200 lbs. cottonseed meal and 200 lbs. acid phosphate, 10,040 lbs. silage; 400 lbs. Ammoline and 200 lbs. acid phosphate, 10,300 lbs. silage; 120 lbs. Nitroline and 200 lbs. acid phosphate, 10,800 lbs. silage. The cottonseed meal contained only 4.95 per cent of nitrogen.

Corn has been grown here in sufficient quantities to feed the work animals (varying in number from six to ten) and for the past two years to feed the dairy cattle, not only on silage made largely from corn, but on crushed corn, cob and shuck meal, leaving only

cottonseed meal to buy and we calculate on getting the feeding value out of this meal for nothing, the fertilizing value of the manure paying the cost of the meal.

Oats.—Quite a lot of work has been done here with oats in testing a number of varieties and also in testing the fertilizer requirements of the crop. The result of tests with varieties has been that only rust-proof oats can be successfully grown here and that other kinds, while growing nicely in the cooler months of winter and early spring, succumb to fungous diseases with the approach of warm weather. The most of the tests with fertilizers under oats have been conducted on seven permanent plats of land of one-fourth acre each, set aside in 1906 for work with fertilizers. On these seven plats oats have usually been grown during the fall, winter, and very early spring and have been followed by such crops as cowpeas, corn, and peanuts. The main purpose in setting aside these permanent plats of land was to test the value of raw phosphate rock and in fertilizing the several plats each crop has received the fertilizers given in the table on page 23, the oats being fertilized in the fall just before being planted and the crops following them on the same plats were likewise fertilized before they were planted. In fertilizing leguminous crops the nitrogenous fertilizers have been left out. Oats have been planted on these plats for four falls in succession and for three years made good yields, but in 1911 they were grazed heavily the winter before and the seasons were poor besides, so that the oats were almost a complete failure and we did not think it worth while to keep the yields of the several plats separate. For three years these seven plats were divided in two equal parts and one-half of each given a top dressing of nitrate of soda and this we harrowed in as best we could. In 1908 this application of nitrate did considerable good as the rains came and dissolved the fertilizer so that it got to the plant roots, but for two years, while efforts were made to give the nitrate of soda when rains were expected, these rains failed to come and the fertilizer did no appreciable good and we do not report the results. The following table gives these results calculated to the acre basis both as to fertilizers applied and to yields of the several crops:

Number of Plat.	Applications of Fertilizers calculated in pounds per acre.	1908. Yield of oat hay in lbs., and corn in bushels per acre.	1908. Yield of oat hay in lbs. per acre, 80 lbs. nitrate of soda per acre.	1909. Yield of oat and peavine hay in lbs. per acre.	1910. Yield of oat hay in lbs. per acre.	1911. Yield of peanut hay in lbs. per acre.
1	400 lbs. Raw Phosphate Screenings, 200 lbs. Cottonseed Meal	4320 lbs. oats 26.0 bu. corn	4720 lbs. oats	2480 lbs. oats 3250 lbs. peas	3380 lbs. oats Peas turned under	Oats failed. 2080 lbs. peanut hay
2	200 lbs. Acid Phosphate, 200 lbs. Cottonseed Meal,	4440 lbs. oats 24. 4 bu. corn	5360 lbs. oats	2480 lbs. oats 3320 lbs. peas	2760 lbs. oats Peas turned under	Oats failed 2280 lbs. peanut hay
3	200 lbs. Acid Phosphate, 200 lbs. Cottonseed Meal, 200 lbs. Kainit	5040 lbs. oats 20.0 bu. corn	4960 lbs. oats	2560 lbs. oats 4000 lbs. peas	2920 lbs. oats Peas turned under	Oats failed 2400 lbs. peanut hay
4	400 lbs. Raw Phosphate Screenings, 12 tons Stable Manure (applied on May, 1908)	4880 lbs. oats 35.5 bu. corn	6400 lbs. oats	3920 lbs. oats 5080 lbs. peas	3480 lbs. oats Peas turned under	Oats failed 3040 lbs. peanut hay
5	200 lbs. Acid Phosphate	4640 lbs. oats 18.3 bu. corn	5040 lbs. oats	2160 lbs. oats 3160 lbs. peas	2640 lbs. oats Peas turned under	Oats failed 2272 lbs. peanut hay
6	400 lbs. Raw Phosphate Screenings	3480 lbs. oats 16.1 bu. corn	4600 lbs. oats	1880 lbs. oats 2480 lbs. peas	2440 lbs. oats Peas turned under	Oats failed 2304 lbs. peanut hay
7	Check	2840 lbs. oats 16.6 bu. corn	4360 lbs. oats	1840 lbs. oats 1760 lbs. peas	2320 lbs. oats Peas turned under	Oats failed 1968 lbs. peanut hay

Remarks.—The raw phosphate screenings used were kiln dust and analyzed about 20 per cent phosphoric acid. It was not ground as fine as it should have been and beginning with 1911 we have discontinued using it and have substituted finely ground floats containing a higher percentage of phosphorus. The stable manure used on plat four was bought in New Orleans and cost about seventy-five cents a ton delivered at McNeill and analyzed as follows: 1.65% phosphoric acid; 1.33% nitrogen; 1.91% potash; 14.80% moisture. The sample analyzed, however, had been allowed to dry out quite a good deal before the moisture was determined and the manure as weighed out to the land must have contained three times the amount of moisture, as was shown in the sample analyzed. Only one application was made to this plat.

This Station has never been able to thresh any oats and has had to use oat hay entirely. A good portion of the feed for work animals has been supplied by oats and the crop has been used extensively as winter grazing for milk cows. Some heavy crops of oat hay, heavily headed, have been made here and in 1907 and 1908 more than three tons of oat hay per acre was made on fields of considerable size.

Varieties of oats and wheat.—In 1910 and 1911 considerable work was done here in testing varieties of small grain, usually on one-fourth acre plats. In the fall of 1909 ten plats of one-fourth acre each were fertilized at the rate of 200 lbs. each of acid phosphate and cottonseed meal per acre and planted at once to small grains which were harvested early in May of the following year with results as follows, calculated in pounds of hay per acre: Texas Red Rust Proof oats, 2240 lbs.; Rye, 560 lbs.; Early Burt oats, 1360 lbs.; Appler oats, 2240 lbs.; Turf oats, entirely destroyed by rust; Dietz Mediterranean wheat, 2200 lbs.; Blue Stem wheat, 1600 lbs.; Fultz wheat, 1080 lbs.; Fulcaster wheat, 1000 lbs.; Barley, 1560 lbs.

In the fall of 1910 twenty-two varieties of oats and wheat were planted here, the work with the wheat being done in co-operation with the other stations of this state. These crops did fairly well through the winter, but with the approach of spring rust set in and practically destroyed the entire lot so that it was useless to keep records of yields. Before this rust advanced very far one-half of each of the plats was given a top dressing of nitrate of soda and this restored the green color for a time, but finally all alike were destroyed. All these varieties were grazed by cattle the winter before and this may have had something to do with the failure, but the same crops were grazed the same

way during the previous winter and apparently were not harmed in the least by it.

Alfalfa, crimson clover, etc.—Mention has been made in previous reports of the efforts made here to grow alfalfa. For several years this crop was planted broadcast after giving the land preparatory treatment to rid it of grass seeds, but always with the result that crab grass would run away with the alfalfa during the succeeding summer. Alfalfa seed were then planted in drills for three years after thoroughly preparing the land, fertilizing the same well, and liming portions of it with good application of air-slaked lime. This alfalfa usually came up to good stands or else was replanted until good stands were obtained. It was cultivated regularly in spring and summer and at times hoed when the grass could not be kept down with plows. The result of all this was that the alfalfa disappeared and we feel safe in saying that it is a crop unsuited to South Mississippi conditions and had best be let alone by those expecting to make it profitable.

Crimson clover has been tried here almost as often as has alfalfa with results considerably more encouraging, though this crop has not been a complete success. The best crimson clover ever grown here was planted in the fall of 1910 and in the early spring of 1911 one-half of the plat was given a top dressing of nitrate of soda at the rate of 80 lbs. per acre. This nitrate made a wonderful change in the clover and the half receiving it made a first class growth while the half that did not receive the nitrate did almost nothing. Burr clover and red clover have also been planted here numerous times and both have done only fairly well, not so poorly that we could class them as failures, nor so well that we could recommend them as profitable crops. Vetch has nearly always done remarkably well, making a fine growth of vine, but the trouble has been in getting it to reseed itself. Unless it does reseed itself the expense of annual seeding will be too expensive to make the crop profitable. During the fall of 1911 one of the richest spots of land on the place, a two-acre lot where dairy cattle have been penned at night for a considerable length of time, was sown to crimson, burr, and red clovers and also to vetch and oats. These crops all came up to good stands and in the spring will be given top dressings of nitrate of soda. If, after this treatment, one of them should fail to grow successfully we will feel justified in saying that such a one would be unsuited to farm conditions in this section.

Sweet potatoes.—The soils here are peculiarly adapted to sweet potatoes and the crop is largely grown not only for home consumption,

but also for a money crop. These potatoes are shipped from McNeill and the neighboring town, Carriere, in car lots and sold largely on the Birmingham market. Since the coming of the boll weevil this is possibly the most reliable money crop grown here, being even better than sugar cane so far as bringing in money for settling fertilizer bills, always due in the early fall. For several years this station took a leading part in demonstrating the market possibilities of this crop and at one season shipped three carloads, but since others have taken up the work, this station has discontinued growing potatoes almost entirely.

Considerable work has been done here in determining the fertilizer requirements of the crop and in 1907 twenty plats of land of one-twentieth acre each were selected to further carry this work. This same land had been used the year before for the same purpose. This land was flat-broken, laid off into rows three and three-quarter feet apart, fertilized, bedded, and potato slips were set out May 24th and reset May 28th to be sure of a stand. The work was all done in duplicate, the twenty plats being fertilized in ten different ways. These potatoes were dug Nov. 24th and separated into two classes, merchantable and seed potatoes, the latter being too small for market.

The quantity of fertilizer and the total yield of potatoes each calculated to the acre follows, the fertilizer being reported in pounds and the potatoes in bushels per acre: no treatment plat, 159 bu.; 200 lbs. cottonseed meal, 207 bu.; 200 lbs. acid phosphate, 212 bu.; 200 lbs. kainit, 211 bu.; 150 lbs. cottonseed meal and 150 lbs. acid phosphate, 224 bu.; 150 lbs. cottonseed meal and 150 lbs. kainit, 218 bu.; 150 lbs. cottonseed meal, 150 lbs. acid phosphate and 150 lbs. kainit, 247 bu.; 150 lbs. cottonseed meal and 300 lbs. acid phosphate, 243 bu.; 300 lbs. cottonseed meal, and 150 lbs. acid phosphate, 231 bu.; 150 lbs. acid phosphate and 150 lbs. kainit, 233 bu.

Sugar cane.—Our work here with sugar cane has been pretty thoroughly covered by a special bulletin dealing with the subject and issued as bulletin No. 99 of the Mississippi Experiment Station. Some work has since been done with this crop, for instance in 1911 about eight acres of land was devoted to it and the yields were first class, but a lack of funds prevented the manufacture of this cane into syrup and the entire crop was banked and is being held with the hope of disposing of it as seed cane. The demand for seed cane in the state is very great at the present time, but freight rates are practically prohibitive and we have some doubts about being able to sell the cane for seed on this account. There ought to be a great demand for the

syrup made from cane grown on these lands as the quality equals or even surpasses the best maple syrup, but as a matter of fact the farmers who grow it have great difficulty in disposing of it at all.

It is a crop that requires a considerable outlay for fertilizers, and when the syrup is made it has to be put up in cans in order to be marketable at all. These cans cost from seven to ten cents each, and there being no quick market on which to sell the syrup the average grower frequently has difficulty in raising the money with which to pay his fertilizer bills in the fall and buy the necessary cans. Sugar cane is a very exhaustive crop on the land as well as an expensive crop to plant, cultivate, and manufacture.

The yields are frequently very heavy, having reached here on a fractional acre at one time as much as 57 tons to the acre, a ton corresponding roughly to twenty gallons of syrup, but such yields are exceptional and an average of twenty tons per acre over any considerable quantity of land is very good indeed.

The greatest thing to be desired now is the establishment of reliable markets for this syrup, first by showing the people how to make the best grade of syrup and then by educating the consumers in other states or sections to appreciate the merits of such syrup. Heretofore the most of this syrup has been made on crude evaporators and cooked to almost every conceivable density so that it either sugared or soured before it reached the consumers in other states. This station has done enough work with syrup to know that when cooked to a density of 34° *Beaume* hot this syrup will keep for years if put up in cans and sealed while still hot. We could do a good work here by planting large quantities of cane every year, making it into the best syrup, and putting this syrup on the markets of other states where it would teach the people the high quality of the syrup made in South Mississippi. This was the original intention when the expensive syrup plant was built here, but to do this requires that we either have a larger appropriation or else use the money received from the sale of this syrup for carrying on the work. There are several inexpensive plants near McNeill now, patterned in part after the one at this Station, on which the individual farmers are making a grade of syrup that would do credit to the most costly and modern manufacturing establishment. The principle on which these farmers work is that of thoroughly skimming the juices as they are evaporated and of cooking a definite quantity of this juice down to a density of about 34 degrees and of sealing the hot syrup at once in cans. These simple plants do not necessarily cost any more than the old evaporators, the pans being the only dif-

ference and these may be made at home out of cypress or poplar boards for sides and galvanized iron or copper sheets for the bottom. The essential difference between syrup made by the two methods is that with the old evaporators the juice runs in and the syrup out all the time and it is impossible to make any two lots exactly alike, while with the pan the entire output is cooked to the same density as measured by a saccharimeter and not by the eye.

Rotation experiments.—In 1903 four plats of land were set aside here for permanent work with rotations, the object being to rotate the crops on three of these plats while the other was to grow cotton continuously. These plats were each one-half acre in size and each was divided into two equal parts, one-half to be fertilized each year and the other half to receive no fertilizer at all. In this way we hoped to compare rotations with and without fertilizers with continuous one-crop cultivation, but the first two years convinced us that unless the peas on the three plats where crops were rotated were fertilized they would make no growth at all and therefore do no good in helping to build up the land, therefore, from 1905 on, these peas were fertilized each time they followed oats in the rotation at the rate of 200 lbs. of acid phosphate per acre. The rotation adopted was a 3-year 5-crop one, the crops being corn, followed by cowpeas grown as a catch crop; oats planted in the fall and followed by peas after the oats were harvested, the peas being fertilized with acid phosphate on fertilized and unfertilized halves alike; and cotton, the third year. The cotton was always fertilized with a mixture of two parts acid phosphate and one part cottonseed meal at the rate of 300 lbs. per acre; the corn with a mixture of equal parts acid phosphate and cottonseed meal at the same rate per acre; the oats with a mixture of two parts cottonseed meal and one part acid phosphate at the rate of 300 lbs. per acre; and the cowpeas following the oats at the rate of 200 lbs. acid phosphate alone per acre. As stated, after 1905 the peas on both fertilized and unfertilized ends were given this application of acid phosphate.

The following table gives the yield of each plat in the respective crops calculated in pounds of seed cotton, of peavine and oat hays, and in bushels of corn per acre:

		1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.
PLAT 1.	Fertilized	2568 lbs. oat hay 3540 lbs. pea hay	758 lbs. cotton	28.0 bu. corn 1652 lbs. pea hay	2800 lbs. oat hay 2828 lbs. pea hay	1044 lbs. cotton	37.8 bu. corn	2840 lbs.oat hay 4000 lbs. pea hay	404 lbs.cotton	36.6 bu. corn
	Unfertilized	1920 lbs. oat hay 1560 lbs. pea hay	276 lbs. cotton	17 bu. corn 1092 lbs.pea hay	1840 lbs. oat hay 1232 lbs. pea hay	504 lbs. cotton	16.1 bu. corn	2320 lbs.oat hay 2360 lbs.pea hay	280 lbs.cotton	20.0 bu. corn
PLAT 2.	Fertilized	21.0 bu. corn	3280 lbs.oat hay 2348 lbs.pea hay	904 lbs. cotton	27 bu. corn	1296 lbs.oat hay 3098 lbs.pea hay	680 lbs. cotton	Corn destroyed by worms.	800 lbs. oat hay	336 lbs. cotton
	Unfertilized	11.0 bu. corn	1280 lbs.oat hay 292 lbs. pea hay	280 lbs. cotton	7.8 bu. corn	840 lbs. oat hay 2083 lbs.pea hay	380 lbs. cotton	Corn destroyed by worms	400 lbs. oat hay	60 lbs. cotton
PLAT 3.	Fertilized	1120 lbs. cot.	24.7 bu. corn 1660 lbs. stover 560 lbs.pea hay	3200 lbs.oat hay 3112 lbs.pea hay	1312 lbs. cot.	24.4 bu. corn	2720 lbs.oat hay 3560 lbs.pea hay	812 lbs. cotton	41.1 bu. corn	Oats failed 4500 lbs. pea hay
	Unfertilized	500 lbs. cot.	13.6 bu. corn 672 lbs. stover	1360 lbs.oat hay 1984 lbs.pea hay	710 lbs. cott'n	11.6 bu. corn	1080 lbs.oat hay 1980 lbs.pea hay	576 lbs. cotton	25.7 bu. corn	Oats failed 3400 lbs.pea hay
PLAT 4.	Fertilized	1118 lbs. cot.	980 lbs. cotton	724 lbs. cotton	936 lbs. cot.	836 lbs. cotton	664 lbs. cotton	560 lbs. cotton	252 lbs. cot.	252 lbs. cotton
	Unfertilized	558 lbs. cot.	204 lbs. cotton	272 lbs. cotton	360 lbs. cot.	160 lbs. cotton	52 lbs. cotton	104 lbs. cotton	20 lbs. cotton	20 lbs. cotton

Weather records.—Ccmplete weather records have been kept here for a number of years, in which maximum and minimum temperatures, rainfall, character of the sky, and prevailing directions of the wind are recorded daily. These records were partially destroyed in 1904 by a fire which destroyed the main building here. Summer temperatures have never gone very high and only twice have they gone as high as one hundred or above. Thirteen above is the lowest the thermometer has ever registered in the nine years and the cold spells are usually of very short duration. The rainfall is quite heavy and a large part of it comes in the summer months and there are times during June, July, and August when it will rain every day in succession for ten days. The records show that in June of 1910 there were sixteen and in July twenty-two rainy days. These frequent showers continued through August and frequently through September and made it very hard to save dry forage. The frequent showers also are very detrimental to the fruiting of cotton and make the control of the boll weevil next to impossible. These same showers are helpful to sugar cane, corn, etc., and make an immense growth of peavines, but prevent the fruiting of the peas. On account of these frequent showers we have found it next to impossible to save corn stover, for even if it is well dried when put in the shock the damp weather, sure to follow, will frequently cause it to mold.

In the table following is given the maximum and minimum temperatures and rainfall for each month, with the total annual rainfall for a number of years:

YEAR.	January			February			March			April			May			June			July			August			September			October			November			December			Annual Rainfall.
	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	
1903					22				16.01	86	41	.05	92	48	1.38	97	54	4.39	98	62	11.05		66	8.01	96	50	1.65	91	36	.33	85	25	.59	78	24	4.74	
1904	70	22	4.04	83	29	4.96	86	33	2.71	90	42	1.60	95	52	2.57	98	63	4.67																			
1905		16	7.77		13	8.43		40	9.67	93	38	11.59		57	6.36	98	64	5.55	97	63	8.50	94	67	5.54	93	59	3.34	86	39	8.03	79	36	3.44	69	25	7.25	85.47
1906	75	25	3.46	70	29	4.51	79	28	10.57		38	1.96	94	45	3.02	99	64	5.47	95	68	5.80	100	68	3.83	95	65	10.23	85	38	.78	84	27	1.19	80	26	2.38	53.20
1907	80	28	1.16	78	30	6.35	90	41	1.22	85	30	6.99	91	49	10.86	95	54	2.71	98	68	6.11	97	66	10.48	96	60	6.06	90	38	1.32	81	28	6.61	74	27	6.65	66.52
1908	76	25	6.05	75	27	4.92	90	38	3.00	89	48	3.98	94	39	8.76	95	61	7.87	96	66	12.32	96	64	7.47	95	48	9.41	84	36	.46	82	30	1.15	80	28	1.19	66.58
1909	78	21	2.48	78	23	5.91	84	34	6.50	87	39	6.25	88	45	12.20	97	66	10.48	97	61	8.74	103	69	7.43	95	47	8.49	94	39	3.76	84	31	1.01	75	20	7.90	81.15
1910	74	22	2.81	75	23	5.13	88	30	.97	87	36	.42	94	54	4.57	94	60	10.09	96	66	10.76	97	70	3.06	96	56	3.11	96	30	4.17	82	32	1.87	72	23	2.12	49.08
1911	81	15	4.20	80	25	2.32	90	37	5.51	85	47	11.08	98	53	2.91	99	67	5.96	93	62	8.94	97	68	6.57	98	68	8.14	93	39	4.18	81	23	3.38	74	26	6.08	69.27

AVAILABLE BULLETINS AND CIRCULARS.

The following bulletins and circulars of the Station may be had on request:

Bulletins.

No.

60—Value of Cotton Seed to the Farmer.
84—Report of Field Work at College Station for 1903.
90—San Jose Scale.
91—Inspection and Analyses of Commercial Fertilizers.
92—Beef Cattle.
93—Peach and Plum Culture.
94—Report of Work at McNeil Branch Station for 1905.
95—The Dairy Cow.
104—Inspection and Analyses of Cotton-Seed Meal.
107—Pork Production at the Delta Station.
114—Inspection and Analyses of Cotton-Seed Meal.
119—Report of Work at the Delta Branch Station for 1907 and 1908.
121—Experiments in Feeding Beef Steers.
122—Report of Work at the Holly Springs Branch Station for 1908.
125—Inspection and Analyses of Commercial Feeding Stuffs.
127—Inspection and Analyses of Cotton-Seed Meal.
128—Inspection and Analyses of Cotton-Seed Meal.
129—Sugar Cane for Syrup Making.
132—The Soils of Mississippi.
133—Inspection and Analyses of Commercial Feeding Stuffs.
135—Cotton 1909.
137—Inspection and Analyses of Commercial Feeding Stuffs.
138—Inspection and Analyses of Commercial Feeding Stuffs.
139—The Boll Weevil in Mississippi, 1909.
140—Cotton Diseases in Mississippi.
141—Control of Diseases of Fruits, Flowers and Vegetables.
142—Inspection and Analyses of Commercial Fertilizers.
143—Inspection and Analyses of Cotton-Seed Meal.
144—Inspection and Analyses of Commercial Feeding Stuffs.
145—Inspection and Analyses of Commercial Feeding Stuffs.
146—Suggestions for Growing Home Fruits.
147—Apple Growing in Mississippi.
148—Inspection and Analyses of Cotton-Seed Meal.
149—Inspection and Analyses of Commercial Feeding Stuffs.
150—Inspection and Analyses of Commercial Fertilizers.
151—Inspection and Analyses of Cotton-Seed Meal.
152—Inspection and Analyses of Commercial Feeding Stuffs.
153—Inspection and Analyses of Commercial Feeding Stuffs.
154—Inspection and Analyses of Commercial Feeding Stuffs.
155—Recent Cotton Experiments.
156—Inspection and Analyses of Cottonseed Meal.
157—Report of Work at the Delta Branch Experiment Station for 1911.
158—Report of Work at McNeill Branch Experiment Station for 1907-1911.
159—Clearing Pine Lands.
160—The Cut Over Lands of South Mississippi.

Circulars.

Asparagus.
Blackleg.
Boll Weevil.
Insect Pest Law.
Underground Waters of Mississippi.
Hairy Vetch.

Address, AGRICULTURAL EXPERIMENT STATION,
Agricultural College, Mississippi.

Mississippi Agricultural Experiment Station.

BULLETIN No. 159.

CLEARING PINE LANDS.

By E. B. FERRIS.

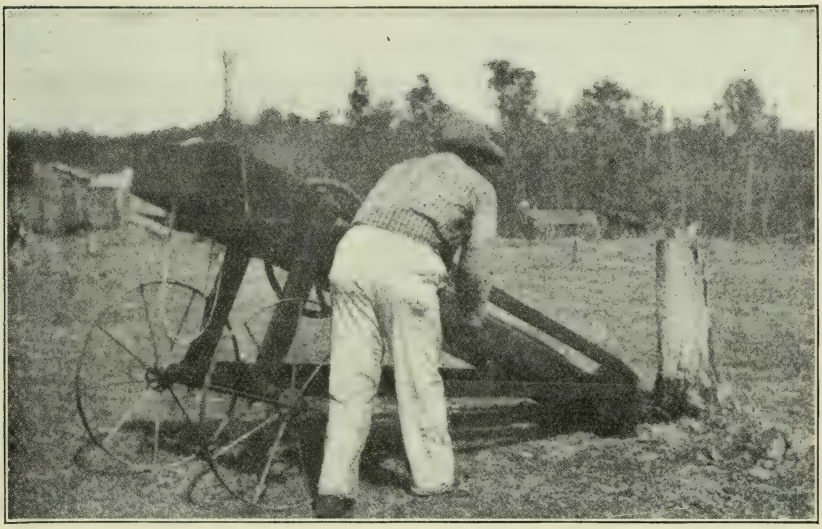


FIG 1.—The Day Boring Machine.

AGRICULTURAL COLLEGE, MISSISSIPPI.

JANUARY, 1912.

TUCKER PRINTING HOUSE JACKSON MISS

STATION STAFF.

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E. R. LLOYD.....Director and Animal Husbandman

W. F. HAND.....Chemist

W. N. LOGAN.....Geologist

J. S. MOORE.....Dairy Husbandman

A. B. McKAY.....Vice-Director and Horticulturist

R. W. HARNED.....Entomologist

DANIELS SCOATES.....Agricultural Engineer

WM. F. KIRKPATRICK.....Poultry Husbandman

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J. R. RICKS.....Agronomist

E. C. EWING.....Cotton Breeding

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B. W. ANSPON.....Assistant Horticulturist

R. N. LOBDELL.....Assistant Entomologist

MISS SIDNEY GAY.....Stenographer

E. B. FERRIS.....Assistant Director, McNeill Station

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G. B. WALKER.....Assistant Director, Delta Station

CLEARING PINE LANDS.*

By E. B. FERRIS.

Introduction.—Practically one-third of the area of Mississippi is embraced in what is known as the Long-Leaf Pine Belt, so called because the soils have now, or once had, a growth of long-leaf pine on them. Large portions of many of the other states bordering on the Atlantic Ocean and Gulf of Mexico are, or once were, covered with this long-leaf pine. The clearing of these lands for agricultural purposes is quite a problem in this state at the present time when so many of them have been denuded of their growth of timber and await development at the hands of the farmer. There is no longer a doubt but that the most of them, when cleared and properly handled, will make among the most valuable farm lands in the state, but the cost of clearing (largely that of removing the stumps) has discouraged many a prospective settler.

As a rule it is quite an easy matter to get these lands free from logs and tree-tops, the saw mills use everything that will make merchantable lumber and in many instances, when the lands are reasonably near a railroad, the wood and charcoal men will use everything else, leaving practically nothing in the way of the plow except the stumps. The removal of these stumps is really the serious problem about clearing pine lands, for unlike the hardwoods and many other pines, the stumps of the long-leaf pine do not decay very fast, many of them being almost as resistant to decay as bronze.

Cultivating Pine Lands.—Heretofore a great deal of the land in this section of the state has been cultivated without first removing the stumps. The surface roots of the pine are very brittle and except for the stump and its tap root it is comparatively easy to cultivate pine lands even for the first year. As a rule the majority of the small farmers in this section depend on a single mule and Georgia stock to do their breaking and cultivating and have not been handicapped by the stumps as they will be when more up-to-date methods are adopted. If, however, the farmer considers his own and the labor of his family as being worth very much, he will find that he cultivates stump lands at a great sacrifice and that there is nothing more than a bare living to be made at it. There are several reasons why this is true, as follows:

1. He cannot by the use of improved implements and machinery substitute mule power for man power in cultivating and har-

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vesting his crops and the day is past when the hoe and scythe can compete with the cultivator and reaper even in the South.

2. Yields will be reduced each year from ten to twenty per cent by space lost on account of the stumps. The average land in this section will have about one hundred stumps to the acre and a space of easily fifty square feet is lost around each stump.

3. Grass is sure to grow around these stumps unles hoes are used to remove it during the entire year, and in doing so grass seeds are scattered over the entire field, necessitating a lot of hoe work with every crop.

Removing Stumps.—The McNeill Experiment Station has removed the stumps from one hundred acres of land, using all known methods, and keeping sufficient data to determine approximately the cost by each method. Fifty acres of this land was cultivated several years before removing the stumps and this experience led us to the conclusion, expressed elsewhere, that it is far better to remove the stumps before the land is put into cultivation. This is true because the lands cannot be cultivated economically with the stumps on them and also because the tree-tops, knots, etc., on the uncleared land will serve as fuel for burning the stumps and save the cost of hauling it.

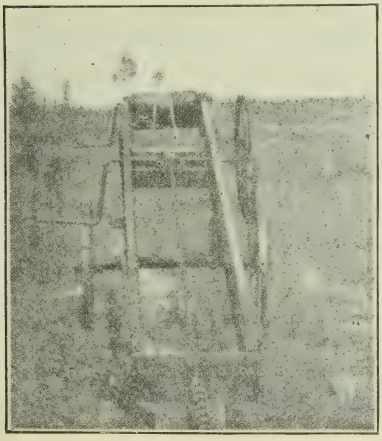
Digging and Cutting.—This is a sure method of removing the stumps if persisted in, but under our conditions has proved the most expensive one except for stumps ten inches or less in diameter, or for certain lands that have been in cultivation a long time and are partially decayed. In clearing land here we have found many stumps on every acre that would require five hours to the stump to dig around and to cut off eight inches beneath the surface of the ground.

Burning.—So far the methods that have been used most successfully in getting rid of these stumps necessitate the use of fire to destroy them, for while the potential value of a fat pine stump is considerable, the cost of getting them to a still and of converting them into turpentine and other by-products is generally greater than the business will stand. Doubtless the time is not far distant when these lands will be cleared of stumps at little or no cost to the owner by disposing of them to these distillation plants.

The common method of burning these stumps is to dig a hole twelve or more inches deep with spade or post-hole digger on one side of the stump and as close to it as possible and to use this as a furnace for firing the stump. In digging these holes it is necessary

that the soil be removed from as much of the surface of the stump as possible so as to allow the fire to come in direct contact with the side of the stump for at least six inches. An ordinary turpentine dipper on a suitable handle makes one of the best implements for removing this soil and exposing the side of the stump. Burning stumps by this method is rather a slow process, but it necessitates no outlay of money and in the hands of careful workers is practically as cheap as pulling them, and besides it may be carried on by a single individual, while to pull them would require a force of several men and a team. In burnng stumps by this method the object should be to keep the fires going constantly in each furnace by using as little wood as possible and this wood to consist as largely as possible of knots that furnish a high heat, are entirely consumed, and consequently do not tend to fill up the furnace as the bark and trash would do. After the stumps are thoroughly ignited we have found it very helpful to use ordinary poles of any kind to assist in burning them, standing the poles diagonally into the furnace and well against the stump at the lower end and keeping them pushed down occasionally as they burn away.

Boring and Burning.—The burning of stumps by the above method may be greatly hastened and facilitated by boring an auger hole diagonally through the stump from the surface of the ground on one side into the post-hole or furnace on the opposite side. This serves as a flue through which the heat and flame pass out of the furnace going through the stump and heating it up to its ignition temperature in one-fourth the time required without the hole. After a stump thus treated becomes thoroughly heated it usually burns out with very little more effort on the part of the attendant and in most instances to a sufficient depth beneath the surface to be out of the way of plows and cultivators. A machine that puts a two inch auger hole through a stump at the rate of twelve inches per minute while actually boring has been invented by J. W. Day, of Crystal Springs, Miss., and may be bought for about twenty-five dollars. This machine is shown in the accompanying figure.



A two-inch ship auger is welded to one end of a three quarter inch iron rod six feet long. Four inches from the other end of this rod a collar is welded and the end of the rod passed through an iron box fastened to a movable frame about eighteen inches square. A bevel gear is then fastened to the extreme end of this rod either by a key or set screw and works into a second gear of the same kind fastened on a horizontal shaft. This horizontal crank shaft is made of one-inch iron rod bent at one end to form a handle and with a fly wheel fastened on the opposite end. It works through two boxes fastened to the movable frame which slides down the main frame as the auger bores into the stump. The upper end of the machine is elevated about five feet and stands on two cart wheels on which it is easily rolled from stump to stump or from field to field by a single individual. This elevation of the frame helps to brace it against the stump in boring, raises the crank shaft to a height at which it can be most easily turned, causes a slight pressure to be constantly exerted against the auger and makes it possible to bore diagonally into the stump. At the extreme upper end of the frame is a small windlass with ropes attached which is used for pulling the auger out of the stump. This machine is quickly adjusted to the stump and in a test made here one laborer in five hours bored through twenty-seven stumps that averaged eighteen inches in diameter at the top and twenty-two inches diagonally through as bored.

The machine just described and illustrated is an exceedingly simple one and could be duplicated by almost any farmer who had the auger, rods, wheels, gears, and oil boxes. Removing stumps by this method has been decidedly cheaper than by any other method tried here, and, as it requires only a small expenditure for machinery, practically no repair bills, and can be operated by a single individual, it ought to appeal strongly to the small farmers of this section who do their own work largely. While a number of small farmers owning these machines speak of them in the highest terms of praise, the writer has known of several instances where they have not given satisfaction to men who were clearing land on a large scale and depended on hired help almost entierly. Considerable judgment has to be exercised in boring these holes in just the right place in the stump and it is difficult to get the average wage hand to exercise any judgment in this direction.

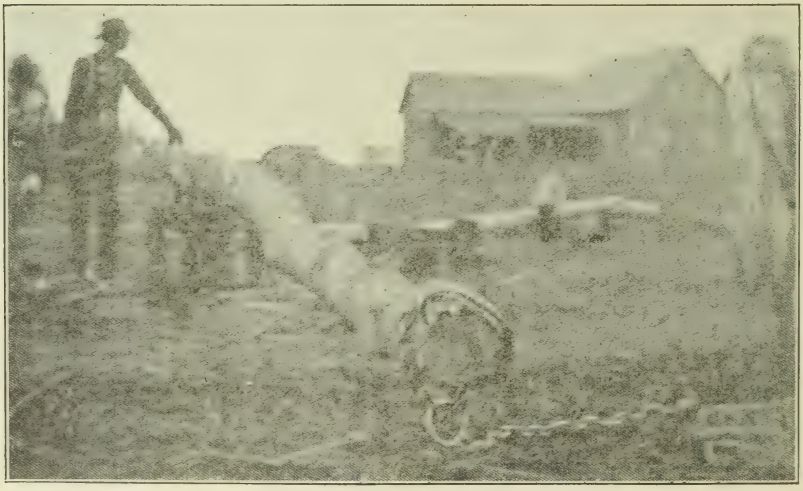
Blasting.—A quick and fairly satisfactory method of removing stumps is by first blasting them with dynamite and then burning

the shattered remains. As most people know, dynamite is a preparation of nitroglycerine mixed with sawdust so as to get it into the form of a solid. It is mixed in several proportions, but the kind most used for blasting stumps is that containing 40 per cent nitroglycerine. This dynamite is moulded into sticks which are one and one-quarter inches in diameter by eight inches long, each stick containing about one-half pound and costing about seven and one-half cents each. With each charge of dynamite a blasting cap must be used which costs about three-quarters of a cent and also from six to ten inches of fuse which costs about sixty-five cents per hundred feet. It requires from one-quarter to one pound of dynamite to shatter the general run of pine stumps, making the cost of blasting alone from five to twenty cents per stump.

In order to shatter these stumps with this amount of explosive it is necessary to place the dynamite into holes bored well into the body of the stump and to tamp same thoroughly with sand or clay. One and one-half inch augers have been used here to bore these holes, starting them at the surface of the ground on one side and boring them diagonally down into the stump from ten to twenty inches, depending on the size. Effort should be made to so place these holes that the pressure from the explosion will be exerted equally in all directions in the stump, otherwise it will simply blow out the weakest side and fail to shatter the stump. The Day boring machine recently mentioned can be used very effectively for boring these holes, reducing the cost over hand boring at least fifty per cent. There is an element of danger in the use of dynamite, but a very slight one if even ordinary precautions are used. The Station has used thousands of pounds of it within the past seven years in clearing the lands here without the slightest accident, the only disagreeable feature of the work being frequent headaches caused by inhaling the fumes from an explosion or by allowing the dynamite to come in contact with any part of the mucous membranes. The greatest danger in handling dynamite is in cold weather. It freezes at a temperature considerably above that of water and in the process of thawing is likely to explode accidentally.

Stump-Pullers.—There are two kinds of stump-pullers, those that pull the stump to the side and those that lift it vertically out of the ground. As many of the tap roots of these pine stumps are as much as ten feet long and taper gently from the surface of the ground to the end under the ground, it seems evident that the force required to lift them vertically would be much less than that re-

quired to pull them from the side. Whether the application of the force to the vertical pull can be made as economically as that to the side pull I do not know. It is certain that the most of the stump-pullers on the market pull from the side. These, however, have been made for pulling other than tap-rooted stumps and this probably accounts for this fact. The Station bought a stump-puller at one time on trial; it was a heavy machine, so much so that it was difficult for two good mules to move it from one anchoring stump to another. A first class machinist was put in charge to operate it with two good mules to do the pulling and several additional hands to handle the cable, pulleys, etc. The machine was a No. 2 "Faultless" manufactured by a firm in Cresco, Iowa, and cost about $150.00. It was, however, too light to do the work, though in every other respect a most excellent machine. With it we were not able to pull even medium-sized stumps without first digging around them and cutting the lateral roots, so that after two weeks' trial the machine was returned to the factory. A machine constructed on the same principle as the one used here, but one size larger, has been used successfully to pull pine stumps in this section. Such a machine costs about $200.00, requires from two to three yokes of oxen and four or five men to operate it, and will pull an average of about fifty stumps a day.

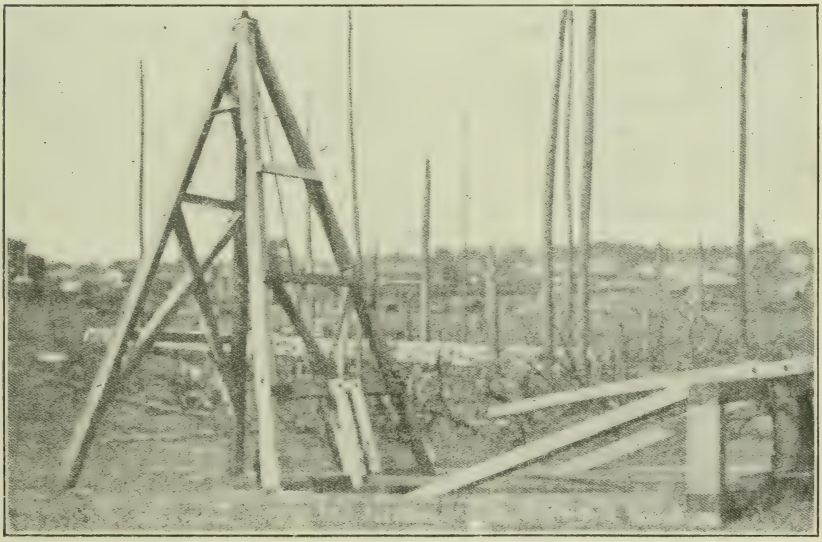


Mr. P. M. Ikeler, of Moselle, Miss., has cleared a lot of land using the stump-puller shown in the accompanying illustration. He found it advisable to blast his largest stumps rather than take the

chance of breaking a cable in attempting to pull them. Mr Ikeler abandoned the stump-puller for the method of burning the stumps with a hole dug beside them and thinks this method of burning cheaper than pulling, especially where the land has trash on it with which to burn the stumps.

Mr. James Hand, of Purvis, Miss., has recently cleared a lot of cut-over land and has largely done the work by contract, paying fifteen cents a stump, the laborers removing them as they choose, which is largely by burning the larger stumps and cutting the smaller ones. The work cost him an average of about fifteen dollars an acre.

A machine to pull long-leaf pine stumps must be very heavy and therefore difficult to move from place to place. A stump lifting machine made by W. R. Wilkinson, of Claxton, Ga., is said to move any sized stump. It lifts by screw power, weighs 2,500 pounds, and sells for $200.00. It requires two men to operate it, one mule to pull the stump, and two mules to move the machine from one stump to another. With this force from twenty to thirty stumps are said to be pulled per day, the holes being filled as the stumps are lifted out of the ground.



A machine has recently been invented by Mr. J. T. Purvis, of Purvis, Miss., that lifts the stump out of the ground by means of a wire cable working through a system of blocks and pulleys and wound around a capstan. The machine is quite a simple one and

is made by taking two 4x8 timbers 18 feet long and placing them on the ground parallel to each other and about six and one-half feet apart. These serve as runners on which the machine is moved from place to place. On one end of these runners a derrick about twelve feet high is built of 4x4 timbers, and on the opposite end a capstan is securely fastened and turned by a lever about ten feet long. The writer has never seen the machine at work, but has understood that, with a few simple improvements, such as a chain that can be made to hold under the tremendous force exerted, the machine may be made to work successfully.

Machines that lift the stumps vertically have to be moved every time a stump is pulled, while those that pull from the side have a decided advantage in this respect. Another decided disadvantage of the vertical lift is the difficulty of getting a hold on the stump to pull by, and this difficulty will be increased with either kind of stump-puller as the saw-mill men come more and more to cutting their stumps at the surface of the ground, rather than three foot or more above it as has been the case in the past. Then, too, after the stumps are pulled, unless they can be sold for distillation purposes, they are still very hard to pile and burn.

After stumps are pulled they are still quite as much in the way as they were in the ground and their ungainly shape makes them extremely hard to handle. They are very heavy and it will require a team of four mules or six oxen to move and pile them. All such work is very slow and admits of much idling on the part of those engaged in it.

Pope Method.—Mr. W. W. Pope, of Tylertown, Miss., has patented a method for burning pine stumps by means of a clay furnace which has proved quite popular with the small farmers of certain sections of the pine belt where it has been tried and where the farmers themselves do their own work to a great extent and as a consequence put more intelligence into it than is possible to get out of the ordinary laborer working for wages. This method is quite similar to the one just described under the head of "burning" except that instead of leaving the top of the furnace uncovered, he uses damp earth or clay for covering this furnace and at the same time piles soil around the entire circumference of the stump. Sheets of iron or tin are used for covering the top of this furnace while the soil is being packed over it and two tubes of iron or tin, one placed vertically over the furnace and the other laid horizontally, are used for molds around which the moist soil is packed. When this is

done the tubes and pieces of sheet iron are withdrawn carefully so as not to disturb the furnace, leaving a perfect fire-box next to the stump with a horizontal opening for getting air and a vertical outlet for carrying off the smoke and products of combustion. Fire started in such a furnace soon eats its way into the stump, while a large per cent of the heat is held within and not dissipated into the surrounding air as would be the case with the open furnace. The heat being held on the inside in this manner consumes the tap root much more completely and follows up the lateral roots for a considerable distance from the body of the stump, at the same time leaving the land in much better shape than by any other method tried here. If purchased, the necessary apparatus for burning stumps by this method will not cost over one dollar while the ingenious farmer can make it himself at no cost at all except his labor. Mr. Pope sells the right to use this method at a very small cost and gives thorough instruction to those who purchase this right. He recommends the making of these furnaces during wet spells of weather when there will be enough moisture in the soil to cause it to pack just right in making the furnace.

The writer has burned out a number of stumps by this method and has found it difficult to get the ordinary farm laborer, without the closest supervision, either to make the furnaces properly or to burn the stumps when made, the trouble being that in starting the fire and in feeding the same the soil caves into the furnace and fills it up. A careful hand, however, can avoid a lot of this trouble and, as stated, the method has worked well in the hands of individuals who exercise the proper care and is popular with many of the small farmers who have tried it.

Other Methods.—Several other methods of removing stumps have been suggested as being practical and have been tried here. One of these was to bore an auger hole into the stump and fill it with nitrate of soda, another to fill such a hole with kerosene oil, and still another to fill such a hole with strong acids such as nitric and sulphuric. We hardly think any of these methods practical. Nitrate of soda will rot a long-leaf pine stump slowly, if at all, and an experiment tried here apparently showed no advantage whatever from it. As a rule these stumps are full of crude turpentine and are very inflammable when enough air can be gotten to them to support combustion. It would seem, therefore, that the logical end to work to would be to get a free circulation of air through the stump while

it is burning, and the auger hole through the stump accomplishes this result as nothing else has done.

Cost.—It is usually cheaper to clear the land of stumps before it is put into cultivation and before the tree-tops, knots, etc., have been removed, because by any method, even though the stumps are pulled, it will require more fuel to burn them than is contained in the stumps themselves. In 1902 this Station removed the stumps from thirty-five acres of land, largely by blasting and burning. This was before the land had been brought into cultivation and all the fallen timber was used to pile around the stumps after they had been blasted and the roots exposed by digging around them. The cost of clearing this thirty-five acres ready for the plow was at the rate of about seventeen dollars per acre. This was before we got a boring machine, when the cost of boring for blasting averaged well above two cents per stump.

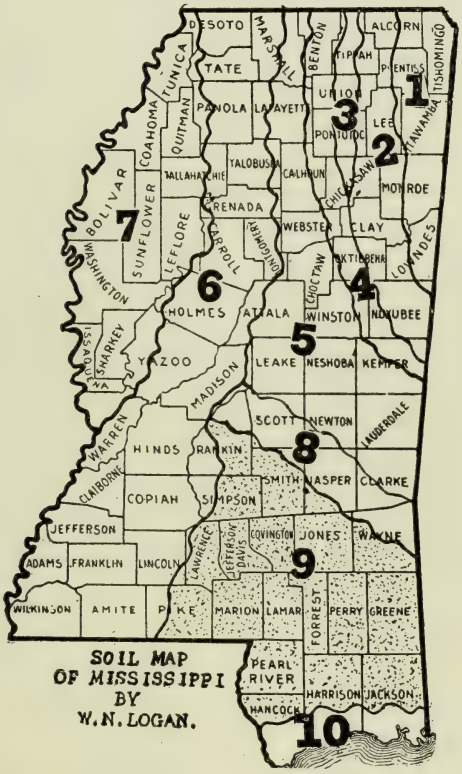
We did not get one of these boring machines until the spring of 1908 and soon after that began an experiment to determine the cost of removing stumps by boring and burning. The land selected had been cut over about seven years before and the most of the sap wood had decayed, but the balance of the stump above the ground and all of it beneath the ground was as solid as when the tree stood on it. There were 2.3 acres of this land selected for the experiment and on it there were 158 stumps that had to be bored and 65 that were small enough to be removed with spade and axe. The 158 stumps averaged 13.6 inches in diameter at the top and the diagonal holes that were bored through them averaged 19.7 inches. It required about three days for one man to bore the 158 stumps, about half this length of time for another hand to dig the post-holes and prepare the stumps for burning, and about five days for one hand to burn out the stumps. It required at least a day and a half to cut out the small stumps, and about another day to cut off the corky parts of the stumps that failed to burn. A little wood had to be hauled too, but the most of the burning was done with the stumps that were cut up and the tops of others that had burned off beneath the ground. Reduced to cost per acre this amounted to less than eight dollars allowing $1.50 a day for the labor. As stated before the cost of removing stumps by this method has been decidedly cheaper than by any other method tried.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi.

BULLETIN No. 160.

THE CUT-OVER LANDS OF SOUTH MISSISSIPPI

By E. B. FERRIS.



1. Northeast Highland Soil Area.
2. Northeast Prairie Soil Area.
3. Pontotoc Ridge Soil Area.
4. Flatwoods Soil Area.
5. Short Leaf Pine Soil Area.
6. Brown Loam and Loess Soil Area.
7. Yazoo Basin or Delta Soil Area.
8. Central Prairie Soil Area.
9. Long Leaf Pine Soil Area.
10. Gulf Coast Soil Area.

The discussion in this bulletin deals principally with the Long Leaf Pine Belt (shaded area) but applies to some extent to other sections of the state.

AGRICULTURAL COLLEGE, MISSISSIPPI
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The Cut-Over Lands of South Mississippi.

Introduction.—The McNeill Branch Experiment Station was established in 1900 by the state legislature for the purpose of studying thoroughly the soils of the long-leaf pine belt of the state of Mississippi, and of giving the information thus obtained to the public which is interested in these soils. Active work was started here in 1902 when the first appropriation was made for the support of this Station and has been going on ever since. A great deal of information concerning these soils has since been obtained which has in part been published and distributed as bulletins and sent out by the United States Station at the A. & M. College.

The long-leaf pine belt is the least developed portion of Mississippi from an agricultural standpoint and many of the counties of this section have less than five per cent of their soils improved, while some of them have less than two per cent. As the name indicates this section was once entirely covered with a growth of long-leaf yellow pine, a considerable percentage of which has already been removed, but this section still has some of the finest bodies of timber in the United States or, perhaps, in the world. As the timber has been removed, immense bodies of this land have accumulated and await development by the farmer. Until within the past few years no concerted effort has been made to induce immigration into this territory and the inhabitants already here have been entirely too few to keep the numerous saw-mills and turpentine orchards in active operation.

Considerable effort is now being made by the owners of these lands, either individually or collectively, and by the boards of trade of a number of progressive towns to advertise the natural advantages of these lands and to induce settlers from other states to come in and develop them. Judging by the numerous requests received here for detailed information about these lands the efforts of these organizations are being felt, and it is largely to supply these demands that this bulletin of information is being prepared. It is hoped to give in it just such information as the average settler will require who comes here from other sections and attempts to develop these lands from the raw state in which they have been left by the saw-mills.

Climatic and health conditions.—The long-leaf pine country as a whole has a delightful climate and is perhaps the most desirable portion of the South to live in so far as health is concerned. The summers are long but never oppressively warm, a good portion of the section being close enough to the Gulf to get the delightful sea breeze that blows

every night from the south. The winters are generally warm and the few cold spells are always of a very short duration. As a rule the soils drain perfectly and there is almost an entire absence of mud, so that while the rainfall is heavy, the country has many of the health advantages of a dry climate. The water soaks quickly into the soil or is rapidly drained off over the surface, so that within a few hours after the heaviest rains the ground dries off and the atmosphere is apparently free from dampness. The country is almost free from malarial troubles; typhoid fever is seldom to be found where any sanitary precautions are taken, and pulmonary troubles are perhaps as seldom found here as in any other portion of the United States. In fact, it is claimed that atmospheric conditions throughout the pine couutry are peculiarly favorable to the cure of pulmonary diseases and tuberculous sanitariums are being established in certain portions of Louisiana where conditions are exactly similar to those here Under the name of the "Ozone" belt this country is becoming famous as a health giving section.

The hookworm disease, however, is quite prevalent throughout the territory and has done much to impair the general health of the native people and to render less effective their efforts to develop the country. This trouble is now thoroughly understood by the medical profession and, like yellow fever, will soon be a thing of the past in the South. This hookworm disease yields readily to the simplest treatment and the people are fast coming to realize its injurious effects and to see the importance of sanitary precautions to prevent its spread. During the past summer thousands of people in this county alone took the treatment given free by the Rockefeller Hookworm Commission.

This is a remarkably well watered country, both as to surface and underground water. Springs, branches, creeks and rivers give an inexhaustible supply of surface water which is usually as clear as crystal. On an inclosure of 160 acres this Station has four different branches which are fed by innumerable springs and which never go dry. In many places overflowing artesian wells may be had at depths ranging from 400 to 1,000 feet and, in the absence of these, shallow wells may be had at less than one hundred feet. This Station has a six-inch well one hundred feet deep from which can be pumped 1,800 gallons per hour for an indefinite time.

A complete weather record has been kept here for nine years and the following table gives a summary of maximum and minimum temperatures and rainfall for the most of this nine-year period·

Year.	January.			February			March.			April.			May.			June.			July.			August.			Sept.			October.			Nov.			Dec.			Total Rainfall.
	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	Maximum.	Minimum.	Rainfall.	
1903					22				16.01	86	41	.05	92	48	1.38	97	54	4.39	98	62	11.05		66	8.01	96	50	1.65	91	36	.33	85	25	.59	78	24	4.74	
1904	70	22	4.04	83	29	4.96	86	33	2.71	90	42	1.60	95	52	2.57	98	63	4.67																			
1905		16	7.77		13	8.43		40	9.67	93	38	11.59		57	6.36	98	64	5.55	97	63	8.50	94	67	5.54	93	59	3.34	86	39	8.03	79	36	3.44	69	25	7.25	85.47
1906	75	25	3.46	70	29	4.51	79	28	10.57		38	1.96	94	45	3.02	99	64	5.47	95	68	5.80	100	68	3.83	95	65	10.23	85	38	.78	84	27	1.19	80	26	2.38	53.20
1907	80	28	1.16	78	30	6.35	90	41	1.22	85	30	6.99	91	49	10.86	95	54	2.71	98	68	6.11	97	66	10.48	96	60	6.06	90	38	1.32	81	28	6.61	74	27	6.65	66.52
1908	76	25	6.05	75	27	4.92	90	38	3.00	89	48	3.98	94	39	8.76	95	61	7.87	96	66	12.32	96	64	7.47	95	48	9.41	84	36	.46	82	30	1.15	80	28	1.19	66.58
1909	78	21	2.48	78	23	5.91	84	34	6.50	87	39	6.25	88	45	12.20	97	66	10.48	97	61	8.74	103	69	7.43	95	47	8.49	94	39	3.76	84	31	1.01	75	20	7.90	81.15
1910	74	22	2.81	75	23	5.13	88	30	.97	87	36	.42	94	54	4.57	94	60	10.09	96	66	10.76	97	70	3.06	96	56	3.11	96	30	4.17	82	32	1.87	72	23	2.12	49.08
1911	81	15	4.20	80	25	2.32	90	37	5.51	85	47	11.08	98	53	2.91	99	67	5.96	93	62	8.94	97	68	6.57	98	68	8.14	93	39	4.18	81	23	3.38	74	26	6.08	69.27

Roads.—The country as a whole has a sandy loam soil which drains quickly and when properly surfaced makes almost as smooth roads as the best of road-building material.

Until very recently, however, the public roads have been little more than cow trails with enough logs and stumps removed to permit vehicles to go through. However, a great interest has now been stimulated in better roads and the several counties have introduced the contract system of working the roads, have removed the stumps, surfaced the road beds, and put in culverts, so that, if the spirit of advancement does not wane, the country will soon have a system of public roads almost equal to the best pikes and at a cost ridiculously small in comparison.

Soils.—In round numbers the state of Mississippi has thirty million acres of land, some ten million acres of which are embraced in the so-called long-leaf pine belt. The soils of this pine belt are sandy loams usually underlaid by sandy-clay subsoils of a red or yellow color. There are several types of these soils, but in his soil survey of the state Hilgard divides them into three classes of which the soils near the coast form one class, while the better drained pine lands to the north and west of these are themselves divided into two classes. This soil work of Hilgard's has since been supplemented by much more complete surveys of limited areas made by the Bureau of Soils of the United States Department of Agriculture, copies of which may be easily obtained by writing to the Bureau of Soils, Washington, D. C. The soils near the coast are mainly low and flat, inadequately drained, and in many instances having little or no clay in the subsoil to hold the fertilizers applied to them. Altogether these coast soils are inferior to the main body of well drained pine lands, which commence from ten to fifteen miles from the coast and extend north and west for one hundred miles or more. These coast lands usually lie in gentle swales and low ridges so that it is nearly always possible to drain them easily, but up to the present time only the ridge lands are regarded as being fit for cultivation. Some of the best trucking communities of the state have recently been developed along the Gulf Coast, while oranges, figs, and pecans are being grown there quite successfully.

The main body of pine lands has excellent natural drainage and the line of demarcation between the two types into which Hilgard divides them is not very distinct. It is a fact that the soils in the more northern and western parts of the pine belt belong to an older formation geologically, and are in the main more fertile than those nearer the Gulf Coast. This is not only shown by the larger size of the pine timber, but by the better growth of vegetation generally. It is, too, better developed agriculturally, due somewhat to the fact that it was nearer

the older agricultural communities and was the first to be settled by the farmer. This country was the last section of the state to get railroads and is by far the section most dependent on them for development, both to carry out its pine timber and to bring in its supply of fertilizers on which the success or failure of the farmers so largely depend. In 1882 when the New Orleans and Northeastern Railroad was built through it, Hattiesburg, now a city of more than ten thousand inhabitants, with four lines of railroad entering it, was public domain, subject to entry at $1.25 per acre. It was about the center of the pine belt, sixty miles from a railroad in any direction, and the few people who inhabited the territory lived from their flocks and herds, growing just enough corn to make their bread and using the manure from cattle to fertilize the soils required to do this.

All the soils of this pine belt are poor chemically and have to be fertilized before they can be cultivated economically. They are especially deficient in nitrogen and phosphorus and unless these are supplied with leguminous crops and raw phosphate rock, or in the form of commercial fertilizers or animal manures there is no profit in cultivating them. However, with the expenditure of a few dollars per acre for plant food these soils are easily the most reliable crop producers in the state, make the heaviest yields of nearly all cultivated crops, and are less affected by extremes of climate, particularly droughts and floods. They are much more easily prepared and cultivated than are the stiffer and richer lands of the state and are susceptible of a higher state of improvement under intensive cultivation, as is evidenced by the fact that by far the greater part of the heavy yields of corn made by the members of the boys' corn clubs were made on long-leaf pine soils in this and other southern states.

Like every other country in the world, this section has good and poor lands all in the same community, made so by such natural causes as topography, soil formation, etc., to say nothing of the influences of good or bad treatment, but in all instances here where the lands are fairly level, well drained, and underlaid by sandy-clay subsoils of red or yellow color, they are good soils and susceptible of a high state of development. The cost of clearing such lands and the expense of building them up to the point of greatest development is quite heavy so that the initial cost of the unimproved lands represents only a small part of the actual cost of the improved farm. This expense is so heavy that settlers with limited means should be careful to keep a considerable reserve fund for improvements and clearing.

These lands will reach their highest state of development in the hands of the small farmer or landowner who will either do his own

work, or give it very close supervision. To trust the cultivation of these soils to the ignorant negro laborer in the manner prevailing over the greater part of the older agricultural sections of this state would likely prove ruinous and the plantation methods so common in the larger part of the cotton sections, while bad there, would be much worse here. The successful farmer in this section should have enough intelligence to rotate his crops, grow leguminous crops whenever possible (and this may easily be done two years out of every three) should keep livestock to make manure, and should have enough knowledge of the use of fertilizers to know how with each individual soil and crop to fertilize most economically. With such a class of farmers the writer fully believes the long-leaf pine belt of South Mississippi would prove the most desirable section of the state, health and other conditions considered. It has at last come to its own in the matter of railroad facilities, at least eleven different lines of railroad, some with several branches, making a complete network of railroads through it. There are several other proposed railroads surveyed through the territory which, doubtless, will be completed within a few years. This goes to show more than words can express what the capitalists of the country think of the future prospects for South Mississippi.

Range for cattle.—The lands in this section are owned in large bodies by timber syndicates and large saw-mill operators and a very small percentage of them have ever been cleared or even fenced. There is no stock law and the range for cattle is practically unlimited, an animal, for instance, turned out at McNeill being free if it chooses to go forty miles south to the Gulf, and possibly more than one hundred miles east, north, or west, before reaching a section where the stock law does exist. The grasses for the greater part of the year are abundant and capable of maintaining cattle sleek and fat from early spring until late fall, but since the greater part of the range cattle are not fed through the winter, they usually get very poor at this season, some die, and the greater part of the gains made in summer are lost in winter, so that the native cattle require five or six years to get a growth they might attain in two years if they were as well fed through the winter as they are through the summer months.

The counties in this section of the state were once known as the "cow counties," because the people lived almost entirely from their flocks and herds, but the value of the timper interest has, in late years, so overshadowed livestock that the section is universally known as the timber belt. The most prosperous people in the country now, except the timber men, are those who handle cattle and sheep, but the most of these depend almost entirely on the range, and grow almost nothing

on which to feed this livestock through the winter. The climate of the country is so mild that it is useless to provide shelter for cattle, even dairy cows doing as well when kept in open lots as when provided with comfortable stalls. The people are coming more and more to realize the importance of providing cheap feeds for their cattle in winter, and are growing now relatively large quantities of corn and velvet beans, which of all crops, apparently comes nearest to meeting the requirements of a cheap feed easily handled, the beans remaining in the fields through the entire winter, or until consumed by the cattle.

The country is entirely within the tick belt, and the problem of getting rid of this pest is bound to be a more serious one here than in other sections of the state where the cattle are confined to pastures, still with a people entirely willing to put up with the temporary hardships of tick eradication, the task would not be a hopeless one.

The writer believes there is a great opportunity in this section for a man with limited means to buy small tracts of these lands to be used for growing feed for cattle and then to take advantage of the unlimited range for grazing them throughout the nine months of spring, summer and fall, and feeding them just enough through the winter to keep them in a growing condition. In this way, lands considerable distances from a railroad could be utilized in growing all kinds of forage crops for which they are best suited and these converted through the livestock into pork, beef, mutton, or wool, before being marketed. By such a system the soils could be furnished with nitrogen by means of leguminous crops, with an abundance of humus through the remains of these crops and the manure from animals consuming them, and with phosphorus through raw phosphate rock rather than acid phosphate and at a cost one-fourth as great. In this way the expense of keeping the lands supplied with the necessary plant food could easily be reduced from three or four dollars per acre to less than fifty cents.

Dairying.—Except for the lack of nutritious milk-producing grasses, no country offers better natural advantages for dairying than this one, and yet few countries have the industry so poorly developed. With its mild climate, abundant water supply, freedom from mud, and convenience to high-priced markets, South Mississippi seems destined to become the future dairy section of the state, especially that part of it situated near the railroads entering New Orleans and within seventy-five miles of that city. When so located, milk can be sent into the city twice daily and the schedule of prices is much higher than in other cities of the same size in the North or East, varying from four cents per point of butter fat in summer to five and one-half cents in winter, or from twenty to twenty-eight cents per gallon from this Sta-

tion's herd of grade Jersey cattle. In addition to the New Orleans market dairy products, and especially cream, may be sold in such places as Laurel, Hattiesburg, Gulfport, Mobile, and the Florida cities, all as much or more convenient to this territory than to the places from which they actually buy such products.

While the native grasses here are not very nutritious, lespedeza or Japan clover is fast spreading naturally over the pastures and ranges, and carpet and Bermuda grasses are becoming quite common. A few years' pasturage with dairy cattle in connection with raw phosphate rock and lespedeza will soon build these soils up to where they will furnish as good summer pasturage as any in the state, a stong point in their favor being that the pastures are seldom dried up here in summer or fall on account of a lack of rain. Here the rainfall is such that pastures remain green generally until frost, while the mild winters and sandy soils make it possible to grow green crops and graze cattle through the entire winter. The heavy rainfall of summer and early fall make it difficult to save hay and dry forage, but contributes greatly to the growth of heavy crops of corn which can best be saved as silage, which of all feeds seems to stimulate the greatest flow of milk. By feeding its dairy cattle on corn silage and cottonseed meal and by grazing them through the winter on velvet beans, rape, and oats this Station has been able to get a better flow of milk, and to make much more money, by having the cows freshen in the fall than in the spring. Winter prices of milk are forty per cent higher than summer prices, considerably less expense is necessary for ice, the demand for milk even at the increased price is much better, and the business more satisfactory in every way.

Clearing pine lands.—The most serious problem connected with the agricultural development of this section is the clearing of the land for cultivation, and the cost of doing this is represented largely in the removal of the stumps. The fact is, these lands are easily brought into cultivation if worked with the stumps on them, for generally they have very little underbrush, and the lateral roots of the pine interfere very little with the plow. A large percentage of the lands already in cultivation are worked with the stumps on them, the owners gradually removing these as they feel disposed, a thing which frequently never happens. The life of the average long-leaf pine stump is very long, the most of them being full of pitch and almost as imperishable as bronze. These lands cannot be cultivated economically with the stumps on them because the stumps themselves take up considerable space, and it is impossible to plow close up to them, and besides without considerable handwork grass will get started around these stumps

and befoul the entire land. It is impossible to use improved implements on stump lands and not only is the cost of preparing and cultivating them made greater by reason of the small plows necessary, but it is impossible to turn into the soil organic matter from restorative crops so necessary to give it life and to furnish nitrogen, so that one frequently notices the ridiculous practice of farmers burning off their velvet bean fields because it is impossible to turn the litter into the soil with their one-horse plows.

The McNeill Experiment Station has removed the stumps from about one hundred acres of these lands, using all known methods and keeping sufficient data to give a general idea as to cost by the several methods. Bulletin No. 159, Clearing Pine Lands, issued by this Station, containing full information in regard to methods and costs, may be had upon application.

FERTILIZERS FOR PINE LANDS.

Practically all the lands in the pine belt have to be fertilized before they can be cultivated economically, so that the question of the use of fertilizers is a vital one to those who cultivate these lands. This fertilizer question has been studied thoroughly here for the past ten crop years and records kept of results obtained by fertilizing a number of crops in many different ways. The soils were first analyzed chemically and physically to determine the actual amount of plant food contained therein, and the relative amount of sand, silt, and clay which determine the physical qualities of the soil. These analyses are given in the following table:

Analyses of Soils taken from Station Field.

Character of Soil.	Chemical Analysis—Per Cent.										Physical Analysis Per cent.			
	Sulphur Trioxide.	Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron and Aluminum Oxides.	Calcium Oxide(Lime).	Magnesium Oxide.	Phosphoric Acid.	Potash.	Sand.	Silt.	Fine Silt.	Clay.
Surface Soil	.055	4.45	4.50	85.28	.051	4.80	.220	.162	.023	.142	53.44	28.65	3.86	5.40
Subsoil	.055	.84	3.58	86.42	.066	7.83	.170	.140	.017	.210	48.78	28.37	3.45	14.92

A glance at the amount of phosphoric acid in soil and subsoil shows the exceedingly small quantity of this important ingredient of fertil-

izers contained in these soils and indicates the relative importance of phosphorus in any fertilizer applied to them. The results of hundreds of tests with fertilizers conducted here under all classes of crops bear out the evident conclusion drawn from a study of these analyses that phosphorus is the mineral element most seriously lacking in these soils. While these soils contain less potash than those of the other soil formations of the state, this ingredient is still relatively high, as compared to phosphoric acid, there being almost nine times as much potash in soil and subsoil as there is phosphoric acid. This fact is also borne out by practical or actual results, for the addition of potash either alone or in combination with phosphoric acid and nitrogen has given little increase of crop. It is well to add that in the last few years indications point to some need for potash on the soils here, especially with crops that are subject to fungous diseases.

Even these crops were not materially benefitted by it for a number of years after the soils were brought into cultivation and the indications are that its effects now are indirect rather than direct. Nitrogen is necessary even on freshly cleared lands here and must from the start be supplied either with commercial fertilizers or by growing leguminous crops. Nitrogen when purchased in fertilizers costs so much, is so easily lost from the soil by leaching or oxidation, and is so cheaply supplied by leguminous crops, so easily grown here either alone or as catch crops, that it is really extravagant to buy this nitrogen in any well planned system of cropping.

When this Station was established here ten years ago, one had to search diligently to find a sprig of lespedeza, now this legume has spread so thoroughly over the section that it is beginning to be regarded as one of the best pasture crops. This plant will in a few years greatly add to the supply of nitrogen in these soils and the writer believes that this lespedeza grown on the unimproved lands and such legumes as velvet beans, cowpeas, soy beans, peanuts, vetch, and perhaps crimson clover grown as catch crops on the cultivated lands will make the purchase of any nitrogen unnecessary, and at the same time, by increasing the supply of organic matter in the soil, make it possible to substitute raw phosphate rock for acid phosphate and at a cost one-fourth as great per pound of added phosphorus.

The almost perfect mechanical composition of these soils cheapens the expense of drainage, lessens the cost of preparation and cultivation, admits of free circulation of air in the soil itself, and gives an ideal place in which to place purchased plant food. The actual plant food contained in such soils is more available to plants than the same quantities would be in soils less tractable and they certainly respond more freely to the use of commercial fertilizers in any form than any other

class of soils in the world. In fact, these soils answer well the Germans' definition of good soils because they are certainly a good place to put fertilizers of any kind with the assurance of getting maximum returns for the money so invested. This does not mean that all money spent for the fertilizers actually used on these soils is judiciously invested, for, as a matter of fact a great deal of it is not. The fact is, people have gone fertilizer-mad, as it were, and have learned to depend almost entirely on buying plant food in a sack rather than on manufacturing the same on the farm by growing leguminous crops and by keeping more live-stock from which to make manure. From the experience with the matter at this Station, it would seem that the fertilizer question resolves itself into the simple proposition of adding more humus to the soil by growing more leguminous crops which at the same time will supply the necessary nitrogen, leaving only the phosphorus to be purchased, which in the presence of an abundance of rotting organic matter can be supplied as raw phosphate rock.

Thus, instead of spending twenty dollars a ton for a complete commercial fertilizer, which, generally speaking, would contain about two dollars' worth of potash and nine dollars' worth each of nitrogen and phosphoric acid, the farmer could on these soils dispense with the potash entirely, and could supply the nitrogen with leguminous crops and animal manures, and instead of paying twelve and one-half cents per pound for phosphorus in acid phosphate could, by increasing the humus content of his soils, get practically the same results by using raw phosphate rock at a cost of three cents per pound for phosphorus. We would by no means recommend that this substitution of raw phosphate rock for acid phosphate be done indiscriminately, for, unless the organic matter is present in quantity, the result would be very disappointing. There is so much doubt as to the financial benefit from the addition of potash to fertilizers used here that we do not hesitate to advise its elimination, except in individual instances where the farmer has satisfied himself that it does good. In this connection it is well to emphasize the importance of conducting simple experiments on every well conducted farm to determine the special needs of their several kinds of soils. The soils of this section are of a sedimentary nature and while they are all alike in some respects they differ widely in others, and not only this, but the fertilizer requirements of the same soil change greatly from year to year, due to methods of cropping and cultivation. It is just as important, therefore, that the farmer should keep in touch with the fertilizer needs of his soils as that he should be familiar with performance of his dairy cows by measuring their feed, weighing the milk, and by frequent use of the Babcock test.

Experience at McNeill has been that lime is seldom of much benefit to these soils, either as a direct plant food, or indirectly as a means of correcting acidity in the soil. If needed at all as a direct plant food it would be supplied along with phosphorus either with acid phosphate or raw phosphate rock, and as a matter of fact, conditions here are against the accumulation of sufficient organic matter in the soils to render them very acid. Our long summers and mild winters dissipate the organic matter in the soils here much faster than is the case in the North where the summers are short and where the ground is frozen for long periods of time through the winter. In the North the soils naturally have more organic matter in them, methods of farming have been such that greater quantities of vegetable matter are yearly added to them, and all this decays much more slowly than it would with us, so that the chances are that lime will never give the same benefit here that it frequently gives in more northern latitudes.

Nitrogen.—In ordinary farm practice it will always be necessary to purchase some nitrogen, especially for growing truck crops and sugar cane which requier highly nitrogenous fertilizers and where the high values of the product grown will justify the purchase of this nitrogen in commercial forms. But even these crops will never be grown to the best advantage except on lands where at least a part of the nitrogen has been added with leguminous crops and active manures. Heretofore cotton has been grown here persistently and to the exclusion of other crops and, being a crop that requires clean cultivation without summer catch crops or winter cover crops, the organic matter present in these soils has not only been burned out, but no more has been added to them, except in the form of commercial fertilizers. The advent of the boll weevil, however, will revolutionize farm practice here and force the farmers to diversify and self-preservation will lead to other crops that will supply nitrogen and organic matter and at the same time require livestock through which to market them. The growth of such leguminous crops as lespedeza, velvet beans, soy beans, cow peas, peanuts, and beggar weed, all of which grow here to perfection in summer; and vetch, crimson clover, and burr clover, which do fairly well in winter, will probably revolutionize present customs about getting nitrogen, especially with the introduction of more livestock to consume these crops and the cottonseed meal that now so largely furnishes our supply of nitrogen in fertilizers.

Cottonseed meal has heretofore furnished a large part of the nitrogen in fertilizers, but it is becoming so highly regarded and in such demand as a food stuff that it is being largely supplanted as a fertilizer by sulphate of ammonia, nitrate of soda, dried blood, tankage and fish

products. This cottonseed meal is worth practically the same as a feed as it is as a fertilizer and by judicious use it can be made to serve first as a feed and then as a fertilizer by carefully conserving the manure from cattle fed on it. In 1902 this Station fed steers with cottonseed meal and hulls on land here and has since kept the records of the increased yields of corn and cotton due to this manure, finding that it is possible to get both values. With dairy cattle the Station is now carrying on somewhat similar work by feeding largely on cottonseed meal as a concentrate and by confining the cattle at night on small paddocks near the barn. In this way a considerable acreage has been enriched while the manure from the herd during the day is dropped on the pastures where it is as valuable as a grass producer as it would be as a fertilizer for any other crop. Cottonseed meal is an ideal source of nitrogen for most farm crops and at the same time furnishes small quantities of potash and phosphoric acid. It is easily distributed and with acid phosphate and potash salts makes a mechanical mixture easily distributed and entirely inoffensive to smell or to handle. The nitrogen in this meal is in an organic form and has first to be decomposed and to undergo a chemical change before it can be taken up by plants, and for this reason it does not meet the requirements of quickly maturing crops, such as early vegetables, so well as does nitrate of soda.

Sulphate of ammonia is being used largely now as a source of nitrogen and experience here has been that it is fully equal to cottonseed meal so far as availability is concerned, but that it does not mix so well with acid phosphate, nor is it so easily distributed, having a decided tendency to form into lumps and to refuse to pass evenly through the opening in the distributer. It contains a much higher per cent of nitrogen than does cottonseed meal and for the past few years this nitrogen has sold at several cents per pound less than that in the meal. The nitrogen in sulphate of ammonia is not directly available to plants and has first to undergo a chemical change, so that it has no advantage over cottonseed meal in this respect.

Nitrate of soda is an important source of nitrogen, is easily dissolved in the soil and immediately available to crops. It is especially valuable as a source of nitrogen for early vegetables, and as a top dressing for other crops where immediate results are wanted. Being so readily soluble it is easily leached out of the soil and is also lost by evaporation from the surface in dry weather, if it should fail to be properly covered. It is excellent as a top dressing for oats in the spring, but care should be exercised to put it on just ahead of a rain, otherwise it may be lost entirely. Nitrate of soda does not mix well with acid phosphate, either mechanically or chemically, having a tendency to gum and also

to have its nitrogen driven off by the acid in the acid phosphate. This material is imported into this country from South America by the Nitrate Agencies Company, New Orleans, La. This concern has been giving especially good prices on this and other fertilizing materials when ordered in carload lots.

Dried blood, tankage, and fish-scrap are all organic sources of nitrogen, easily decomposed and furnish highly available nitrogen. The first two are by-products of the slaughter-houses while the latter is obtained along the seacoast where fish are handled in large quantities. They mix well with acid phosphate and are easily distributed, though the odor of some of them is anything else than agreeable. Bat guano was at one time an important source of nitrogen, but the supply is largely exhausted. It is regarded as being especially good for truck crops and is used largely in this state in trucking communities.

All the materials furnishing nitrogen are sold on guaranteed analyses, and the purchaser should be careful before buying to know what this guarantee is, otherwise he can be badly cheated by buying different grades of even the same material.

Phosphorus.—As stated before, phosphorus is the element of fertility most seriously deficient in these soils, and it must be purchased in some form and put there for it cannot be obtained by growing restorative crops as is the case with nitrogen. It is, however, a much cheaper element than nitrogen, costing in its soluble form less than one-third as much per pound as nitrogen, while in its raw or insoluble form it costs less than one-twelfth as much.

While there are many sources of phosphorus in fertilizers, such as cottonseed meal, ground bone, tankage, and slags, the source of the main supply is phosphate rock mined in Canada, South Carolina, Florida, and Tennessee. The rock used in this section is largely mined in Tennessee. The phosphorus in the raw rock is insoluble in water and cannot be taken up directly by plants, nor is it of any value as a plant food in its raw state except when finely ground and on land where there is an abundance of decaying organic matter. On such soils the decay of the organic matter generates acids which act on the raw rock in much the same way that the sulphuric acid acts in the manufacture of acid phosphate, though much more slowly, of course. For a long time phosphate rock in its raw state was thought to have little value as a fertilizer and it was seldom recommended by experiment station men, but since the actual phosphorus in it costs only about one-fourth what it does in its soluble form and it is known to become gradually available in the presence of this decaying organic matter in the soil, it is coming into favor. This Station has used the raw rock very successfully, especially

in connection with velvet beans, the decay of which leaves great quantities of humus in the soil.

Acid phosphate is the source of nearly all the phosphorus in this state and is made by grinding the raw rock to an impalpable powder and mixing the same with equal quantities of strong sulphuric acid which brings about at once a chemical change by which the phosphorus is rendered soluble and a considerable quantity of calcium sulphate or gypsum is formed. Acid phosphate forms the greater part of the average complete commercial fertilizer sold in this state, many popular brands being made by mixing together 600 pounds of cottonseed meal, 1,200 pounds of acid phosphate, and 200 pounds of kainit. This formula gives a mixture analyzing about 1.75% each of nitrogen and potash and 10% of phosphoric acid. In these experiments here to determine the fertilizer requirements of these soils every application of acid phosphate has given a marked increase of crop and on lands that have previously grown leguminous crops has been all that was required to give maximum yields, while for the legumes themselves it furnishes the plant food needed regardless of previous cropping.

Potassium.—This element is furnished by several different materials, such as cottonseed meal, wood ashes, ground tobacco stems, and a number of minerals. Practically the entire supply of potassium now used in this country is imported from Germany where it is mined very much as common salt is mined in this country. The three forms most commonly found on the markets are: kainit, containing 12% of actual potash; muriate of potash with about 50% of potash; and sulphate of potash analyzing about the same as the muriate. In tests at McNeill, kainit has been largely used as a source of potash and the conclusions drawn so far from a large number of such tests have been against the use of this element in our fertilizers. As stated before these soils contain about nine times as much potash as they do phosphoric acid and the relative importance of the two would be at least in this proportion, so far as results here go to show.

Kainit has been used as a source of potash here largely because it was so generally used in the mixed fertilizers sold in the state. It contains only about twelve per cent of potash and some thirty-six per cent of common salt and the chances are that much of the power of kainit to prevent rust in cotton is due to the common salt it contains rather than to any direct aid from potash. The most reliable fertilizer work that has been done here has been with cotton and the plats receiving kainit have usually made more cotton than the blank plats, but the addition of kainit to a mixture of acid phosphate and cottonseed meal has not uniformly increased the yield of cotton. Since the

advent of the boll weevil, plats receiving kainit alone have seldom made any cotton at all, due to the lateness at which it begins to fruit.

CROPS BEST SUITED TO THE SECTION.

Cotton.—Some of the best cotton soils of the state with the exception of the Delta, are in the long-leaf pine section, but the writer has never regarded the lands so near the Gulf as are these at McNeill, forty miles away, as being well suited to cotton, due more to an excessive rainfall during the summer months than to any other known cause. Before the boll weevil made its appearance, yields of cotton here were much less satisfactory than those of other crops and since that time the people in this immediate community have about stopped growing it entirely, though the Station has some cotton this year that will likely make above one-half bale per acre, all having been set before the middle of June. Farther north and west from here the rainfall is not so heavy while the soils are just as responsive to fertilizers, and quite as capable of forcing crops grown on them to early maturity.

These soils are all of a light, sandy nature, quick to dry out and to warm up in the spring and, therefore, capable of growing early crops of every kind. A quick start in the spring so as to have the cotton begin fruiting before the weevils appear in great numbers means more towards getting a crop of cotton than all other influences combined, according to experience here in growing cotton with the boll weevil present, and the writer believes that the well drained hill lands north and west of us will come nearer growing cotton profitably under boll weevil conditions than any other section of the state, the Delta not excepted.

Corn.—The heaviest yields of corn ever grown have been on the soils of this section and they are certainly the most reliable corn lands in the state so far as yields are concerned, though we must admit that the corn weevil is a much greater pest here than in other parts of the state, frequently destroying the corn in the fields if harvesting is delayed too long. The most successful method of growing corn here has been to plant the corn in water furrows made by bedding the land, or better by flat breaking the land first and opening deep furrows with middle burster, distributing the fertilizer at the bottom of this furrow, and after mixing the same with a bull-tongue furrow, planting the corn at the bottom of the furrow and working the soil to same as the crop is cultivated. This gets the roots deep in the ground so that the corn stands the drought better and has much better support against the wind. Experience has shown that corn planted between April

fifteenth and May fifteenth gets much better seasons than that planted earlier and is much less subject to attacks from "bud worms" than that planted later. At the time suggested the weather is nearly always dry and the corn can be cultivated at very little expense, so that with the approach of the rainy season after the middle of June it shoots up like magic, and will mature almost any quantity left in the ground. The prolific varieties that make two or more ears to the stalk are regarded as best and a single stalk to the hill with hills close together gives much better results than double stalks with hills twice as far apart.

Considerable thought has been given to the subject of saving the corn crop here most economically, for as commonly practiced much of the value of this crop has been wasted even after it has been produced. The old method of pulling the leaves from the stalk and saving them as fodder is still practiced to a considerable extent and is a source of much loss. The Experiment Station has harvested a good deal of corn by cutting the stalks while still green, but after the ears have practically matured in the same way that the crop is so generally saved in the North, but the stalks grown here are much larger than the average of those grown in the North and therefore more difficult to save. Then, too, all except the latest platings of corn here mature in summer when showers are of almost daily occurrence, making it practically impossible to properly cure this corn.

A great deal of corn is now being grown here along with velvet beans and the two make an excellent combination, if properly handled, but a great deal of this corn is usually destroyed in the fields by weevils and by rotting, the velvet bean vines pulling many of the stalks down, so that the ears rot on the ground, or else shade the corn so completely that even the ears on standing stalks are damaged during protracted wet spells. This trouble may be practically eliminated by planting the corn very early, in late February or early March, and then planting the beans six weeks or two months later. In this way the corn matures and may be gathered (the ears pulled from the stalks) before the beans are large enough to interfere seriously with the development of the corn or with the gathering of it. As commonly practiced here the corn and velvet beans are planted in alternate rows and by this method a heavier crop of beans will probably result, but at the expense of the corn. The Station has had excellent results by growing corn in every row and by planting the beans by the side of each row of corn about the first of May with corn planted the first of March. In this way the beans are grown entirely as a catch crop and interfere little with a maximum yield of corn which may be harvested in August, leaving the beans almost one hundred days to occupy the land alone. When grown in this way,

average yields of corn have been made, and the beans themselves have shown a value of eight dollars per acre when harvested through milch cows, and the soil left completely hidden with a covering of fallen leaves and uneaten stems, so that the productive capacity of the land was greatly increased in a single season and the cost of fertilizing a succeeding crop correspondingly decreased.

The most satisfactory way of saving the corn crop so far tried at this Station is to convert it into silage. The cost of building a silo is not materially higher than that of a barn for housing the forage and ear corn; every particle of the growing plant is saved and in a condition in which there will be no waste in feeding it; the entire crop can be saved regardless of the frequent rains that make it next to impossible to cure the stalks; and when put in the silo there is no loss from rats and weevils, both of which are very destructive to the stored grain. Practically all kinds of livestock will eat this silage and there is no other feed that equals it, cost considered, as a producer of milk and butter. Cowpeas planted in silage corn will maintain the supply of nitrogen and humus in the soil and may be saved for hay or grazed off by the cattle, horses, and hogs, as conditions warrant.

Small grains.—This Station has done considerable work in testing numerous varieties of small grains, such as oats, wheat, rye, and barley. All of these have proved to be unreliable except the Texas Red Rust Proof oat or closely related varieties, such oats as the "Turf" oat, wheat, and rye being generally badly damaged by rust with the appearance of warm weather in the spring. Yields of as much as three tons of well headed oat hay per acre are frequently made here and the crop generally matures in May or June when weather conditions are favorable for saving hay. For best results these oats should always be planted early in the fall and will furnish good grazing up until March, the sandy nature of the soil making it possible, without injury, to keep cattle on them for the greater part of the time. Heavy yields of corn and fair crops of cowpeas may be grown on the same land after the oats are removed, making three crops in a single year.

Leguminous crops.—Summer legumes, such as cowpeas, soja beans, velvet beans, lyon beans, Spanish peanuts, and Florida beggar weed, have been grown here with marked success and are well adapted to conditions obtaining in the pine belt as a whole. Each of these crops has its special advantage conditioned on the use to which it is put and the way it is to be grown. For instance, none of these crops will equal the cowpea as a purely hay crop, none the velvet bean as a catch crop for winter grazing, none the soja bean as a grain crop for hogs, and none the Spanish peanut as a combination grain and hay crop, while all are

valuable as soil-improving plants and may be grown to perfection when fertilized with phosphorus alone.

Winter legumes, such as crimson clover, red clover, burr clover, and vetch have been grown here with only fair success and it is necessary first to build up the soil with animal manures, or to fertilize them well with commercial fertilizers and then inocculate them with the germ life peculiar to the crop by spreading over them soils from fields which have successfully grown these crops. By so treating the land fine crops of vetch have been grown here and fair crops of the other legumes mentioned.

Alfalfa has been planted here a number of times, the soils have been limed, inoculated, and the crop at times cultivated, but always with the result that the alfalfa has been choked out by the crab grass the following summer.

Sugar cane.—Sugar cane grows here to perfection and when the soils are highly improved the yields are enormous. The Station having made at one time a yield of more than fifty tons to the acre, while a yield of twenty tons per acre is not uncommon. This cane is grown chiefly for syrup, the quality of which, when properly made, being equal to the best maple syrup and superior to any other syrup made from cane grown on heavier lands elsewhere.

A ton of cane corresponds roughly to twenty gallons of syrup which sells generally at from forty-five to sixty cents per gallon, giving no mean revenue per acre. Sugar cane is an expensive crop to grow, requiring well improved land to begin with, liberal applications of fertilizers, considerable expense for seed, and an expense approximating fifty per cent of the worth of the crop as it stands in the field for stripping, cutting, topping, and converting into the finished product, syrup. It occupies the land from two to three years here from a single planting and leaves it in a run-down condition chemically and physically which will require several years for correction. The industry as now carried on in this country is far from what it should be, due chiefly to defects in the manner of manufacturing the syrup, the most of which is made in small lots on crude evaporators, by many individuals who trust to the eye entirely to tell when the juices have been properly cooked, and who usually make as many grades of syrup as there are operators and evaporators. As a consequence a good portion of this syrup either goes to sugar or sours before it reaches the consumer, or soon thereafter, and the trade in it has been greatly demoralized.

This Station has done a great deal of work with sugar cane and has, perhaps, the most complete syrup plant in the country, designed especially for the business and costing more than three thousand dollars.

Work with syrup on this plant and with cheaper outfits easily improvised to meet the especial needs of the individual farmer has convinced us that as good a grade of syrup can be made on the one as on the other, and that the essential difference between the good and bad syrup is mainly due to improper cleaning of the juices as they are cooked and to the fact that they are not usually evaporated to the proper density. To make a syrup that will not sugar nor sour it is absolutely essential that some measure other than the eye, be used to determine the density of this syrup and a saccharimeter or hydrometer may be bought for fifty cents which if used will absolutely guarantee a uniform density for this syrup. Steam heat is decidedly the best means of cooking this syrup, but in the absence of this, cheap home-made pans heated by wood fires may be used, these filled with a given quantity of cane juice and this thoroughly skimmed and cleaned until a density of 34 degrees at the boiling temperature is reached, when it should be quickly removed from the fire and the syrup sealed in cans while still hot. In this way a high grade syrup that will keep for years without sugaring or souring may be made and should be marketed at not less than sixty cents per gallon to the consumer. A special bulletin on this subject has been issued by this Station and may be had for the asking. (Bulletin No. 129. Sugar Cane for Syrup Making.)

Fruits and Vegetables.

Fruits.—This Station has done a lot of work with such fruits as blackberries, dewberries, raspberries, strawberries, mulberries, grapes, apples, peaches, pears, and plums. Blackberries grow wild here in the greatest abundance, dewberries, to a certain extent, while raspberries are never seen and the effort to cultivate them has not been successful. Possibly the best strawberry industry in the South has recently been developed around Hammond and Independence, Louisiana, on lands of this same long-leaf pine type and almost the exact type of soils that we have here.

Strawberries have done remarkably well here and have proved the best paying crop this Station has ever grown. The industry has never been developed here because of a lack of people to grow the berries and not on account of inferior soils or a lack of facilities for getting them to market. Two acres of land planted to strawberries here paid more than two hundred dollars per acre for three successive years from a single setting of plants.

Scuppernong grapes grow here to perfection and have no insect enemies nor fungous diseases that have ever been detected. Other grapes have never done so well, except where they have been sprayed to protect them from insects and fungous diseases, especially the latter.

Mulberries are perfectly at home here and both wild and cultivated varieties do well. A successful experiment at silk production has been carried on near McNeill by Syrians who have used the native mulberry trees for feeding the silk worm larvae. These people report very satisfactory results, claiming conditions as favorable here for the production of silk as in their native country.

San Jose scale and nematode root disease have made the growing of apples, peaches, and plums impossible here and the Station has had to destroy a large number of these trees. It would seem that peaches might be made to grow here to perfection, but the general result has been that after a few years of exceptionally good growth the trees almost invariably die from some cause. Such was the result at this Station and the cause was attributed to both the scale and the root disease.

Pecans are successfully grown over the entire pine belt and the lands near the Gulf coast seem peculiarly adapted to the crop. This Station has a few budded pecan trees that were planted or set out in 1902 and we have been disappointed in the length of time required for them to begin bearing, for the trees have not yet set any fruit.

Vegetables.—This section should reach its highest state of development from an intelligent system of truck growing combined with a healthy livestock industry and especially dairying. The soils are almost an exact reproduction of the fruit and vegetable lands of the Atlantic seaboard and are well adapted to the growth of early crops of various kinds. The sandy nature of the soils causes them to dry out and warm up early in the spring and, therefore, to hasten the production of any crop grown on them. Truck growing, however, requires much more skill and intelligence on the part of the producer than is usually required in the growing of staple crops and is attended by much more risk, for, while the profits may at times be large, the losses may be equally heavy. Such crops occupy the land only a short time in winter or early spring and always make it possible to recoup a possible failure by growing second or third crops.

Freshly cleared lands here are too poor to produce the best quality or quantity of truck crops and should first be improved by the use of animal manures and leguminous crops. However, such crops as strawberries and sweet potatoes do better on newly cleared lands than they do on older soils by reason of the fact that they are troubled less with grass. A few of the most promising truck crops will be mentioned and the remarks based largely on the experience with them at this Station.

Beans.—This is one of the least expensive truck crops to grow as well as one of the most reliable. It occupies the land only about seventy-

five days from March the first, the average date of planting, and does not require an excessively rich soil nor expensive fertilization, while the preparation of soil and cultivation of the crop amounts to very little. With the exception of anthracnose, or the rust of the pod, the crop is not seriously damaged by insect pests or fungous diseases, and this anthracnose only attacks the yellow-podded varieties. One hundred bushels of marketable beans is not an exceptional yield and the prices vary from twenty-five cents to two dollars per bushel shippers' net to the producer. Shippers' net means the amount remitted to the shipper after paying freight or express charges and the commission merchant's charge for selling. After this crop is taken from the land heavy yields of corn with catch crops of cowpeas or velvet beans may be made, or the land planted to a number of other crops, one of the best of which is the sweet potato.

Cabbage.—Unlike the bean the cabbage requires a very rich soil, is more expensive to grow in many respects, and is sometimes seriously damaged here by insect pests, chief of which are the cut worm and cabbage leaf worm. This crop may be grown here either in spring or winter, the climate being mild enough to permit of growing the crop in open fields if the plants are allowed time to get a good growth before the approach of very cold weather. The Station has grown several crops of cabbage by planting the seed directly in the field in early September, thinning the plants later to a stand, and finally marketing heavy yields of cabbage in January and February, after the thermometer had gone as low as eighteen degrees, this being exceptionally cold weather here. Cabbage may be grown here either for the very early spring market or for the late market that usually develops locally and in nearby towns and cities after the early crop has been exhausted, but insects grow much worse as the season advances and the late crop is not so reliable as earlier plantings.

Tomatoes.—These grow to perfection in the pine belt, especially in the more northern and western portions where the climate is less humid and fungous disease not so destructive. When grown at McNeill tomatoes have been greatly damaged by what we know as the blossom end rot which seriously injures the earlier and higher-priced fruit which the plants put on. Spraying with Bordeaux mixture will control this trouble, but frequent showers often interfere with the proper use of this fungicide.

Irish potatoes.—Both fall and spring plantings of potatoes may be grown here with a fair degree of success. The sandy nature of the soils is conducive to the early maturity of this crop and this is usually

at the expense of heavy yields. This Station has made as much as 150 bushels of potatoes per acre, but such yields are much above the average of this territory. The Colorado potato beetle interferes with the crop and will have to be killed several times if they are kept under control. If seed from the spring crop are spread out on an earthen floor in thin layers and covered with sand they will keep through the summer and may be used in the fall for planting a second crop. The usual practice here is to put them under some kind of shelter and for two weeks before planting keep them moist so as to cause them to sprout. The sprouted seed may be planted in dry weather and will soon come up to a stand and give fair yields of potatoes before frost.

Sweet potatoes.—No soils grow a better quality of sweet potatoes than do these here and the yields are usually all that could be desired. The crop does not require an especially rich soil and is grown here largely on newly cleared lands, because on such soils the crop can be grown at a minimum of expense in the matter of cultivation and the yields on such soils are quite satisfactory. The Station has made yields of 250 bushels per acre on these newly cleared lands and has sold them at fifty cents per bushel on the cars at McNeill, loading directly from the field. The market for these potatoes, however, is easily glutted at digging time in the fall and as a rule they do not keep satisfactorily through the winter. They are easily canned and make a most excellent article of diet, scarcely to be distinguished from the fresh potato, but as yet there are no factories here for canning them and the people only grow such quantities as they think will be consumed in the established markets during the fall and early winter. Potatoes grown here are of the yam type and are very sweet and juicy, quite the reverse of the sweet potatoes grown so largely in New Jersey which are dry and mealy. The Northern markets prefer the dry potato and do not furnish a good market for our potatoes which have to be sold almost entirely in strictly Southern cities.

Other vegetables.—Practically all the common vegetables of the South may be grown here successfully and the home garden may be made to supply the table with fresh vegetables the entire year. All crops of the cabbage family, such as turnips, cauliflower, kale, kohlrabi, with lettuce, onions, radishes, etc., have been successfully grown here through the winter months in open fields, and the truckers along the Gulf Coast have made quite a success at growing some of these crops, notably lettuce and radishes for Northern markets, shipping the same in carload lots.

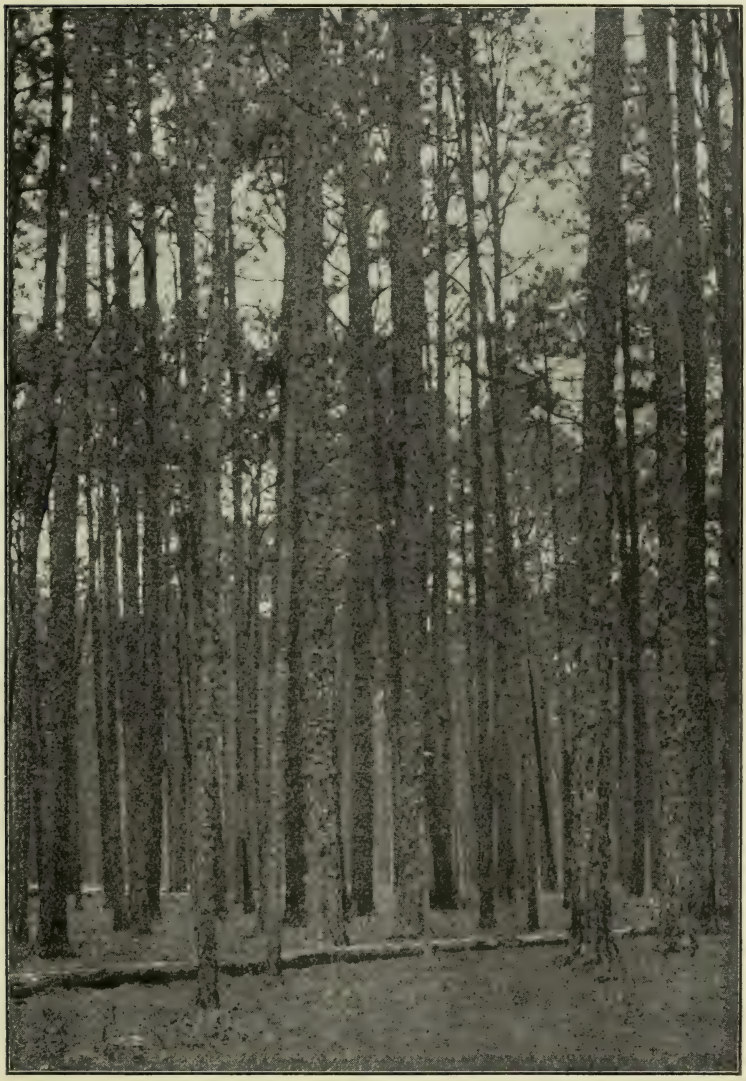
Asparagus has proved a profitable crop here and has been grown in considerable quantity on this Station where a number of experiments have been made with it to determine the best means of fertilizing it with commercial fertilizers.

Other farm crops.—Practically all of the saccharine and non-saccharine sorghums have been successfully grown here, but since corn and the regular sugar cane do equally well, if not better, there is little inducement to grow them.

The soils generally do not have sufficient lime to grow the eating varieties of peanuts very successfully, the tendency with them being to develop faulty pods or "pops," but the Spanish variety does well and is grown extensively. It furnishes one of the cheapest hog feeds that can be grown here and in connection with rape, soy beans, Bermuda pasture, and corn can make this an ideal place to grow pork cheaply. In fact, nearly all root crops do well here, chufas yielding even better than peanuts, while cassava makes possibly the heaviest growth of roots of any crop ever planted at the Station, the same being a very nutritious and palatable feed for livestock.

Hay crops.—The country has very few natural hay crops and has to depend largely on cultivated crops as forage, such as cowpeas, soy beans, peanuts, and sorghum. Mexican clover, a non-legume, usually grows luxuriantly in cultivated fields, largely in corn after this is laid by, and is used to some extent as a hay crop. In certain sections of the pine belt lespedeza grows high enough to cut and makes a most excellent hay. Paspalum or water grass has recently made its appearance in great quantity on the Station farm and grows to a great height, making an immense quantity of a rather coarse hay, the value of which we have never determined. Bermuda grass, while making possibly our most valuable pasture grass, will hardly grow high enough to cut for hay and the same may be said of carpet grass.

The Station is this year trying the three recently introduced grasses: Guinea, Para, and Natal,—and the first two have made almost phenomenal yields of a very coarse hay, while the seed of the last failed to germinate and no plants were obtained. The Para and Guinea grasses will make a number of cuttings here and both will approximate sugar cane in tonnage. They are both very coarse and would probably make better soiling crops than hay crops, though by cutting them frequently the quality of the hay as regards coarseness would be greatly improved.



TYPICAL LONG LEAF PINE FOREST.

AVAILABLE BULLETINS AND CIRCULARS.

The following bulletins and circulars of the Station may be had on request:

Bulletins.

No.

60—Value of Cotton Seed to the Farmer.
84—Report of Field Work at College Station for 1903.
90—San Jose Scale.
91—Inspection and Analyses of Commercial Fertilizers.
92—Beef Cattle.
93—Peach and Plum Culture.
94—Report of Work at McNeil Branch Station for 1905.
95—The Dairy Cow.
104—Inspection and Analyses of Cotton-Seed Meal.
107—Pork Production at the Delta Station.
114—Inspection and Analyses of Cotton-Seed Meal.
119—Report of Work at the Delta Branch Station for 1907 and 1908.
121—Experiments in Feeding Beef Steers.
122—Report of Work at the Holly Springs Branch Station for 1908.
125—Inspection and Analyses of Commercial Feeding Stuffs.
127—Inspection and Analyses of Cotton-Seed Meal.
128—Inspection and Analyses of Cotton-Seed Meal.
129—Sugar Cane for Syrup Making.
132—The Soils of Mississippi.
133—Inspection and Analyses of Commercial Feeding Stuffs.
135—Cotton 1909.
137—Inspection and Analyses of Commercial Feeding Stuffs.
138—Inspection and Analyses of Commercial Feeding Stuffs.
139—The Boll Weevil in Mississippi, 1909.
140—Cotton Diseases in Mississippi.
141—Control of Diseases of Fruits, Flowers and Vegetables.
142—Inspection and Analyses of Commercial Fertilizers.
143—Inspection and Analyses of Cotton-Seed Meal.
144—Inspection and Analyses of Commercial Feeding Stuffs.
145—Inspection and Analyses of Commercial Feeding Stuffs.
146—Suggestions for Growing Home Fruits.
147—Apple Growing in Mississippi.
148—Inspection and Analyses of Cotton-Seed Meal.
149—Inspection and Analyses of Commercial Feeding Stuffs.
150—Inspection and Analyses of Commercial Fertilizers.
151—Inspection and Analyses of Cotton-Seed Meal.
152—Inspection and Analyses of Commercial Feeding Stuffs.
153—Inspection and Analyses of Commercial Feeding Stuffs.
154—Inspection and Analyses of Commercial Feeding Stuffs.
155—Recent Cotton Experiments.
156—Inspection and Analyses of Cotton-Seed Meal.
157—Report of Work at the Delta Branch Experiment Station for 1911.
158—Report of Work at McNeil Branch Experiment Station for 1907-1911.
159—Clearing Pine Lands.
160—The Cut-Over lands of South Mississippi.

Circulars.

Asparagus.
Blackleg.
Boll Weevil.
Insect Pest Law.
Underground Waters of Mississippi.
Hairy Vetch.

Address, AGRICULTURAL EXPERIMENT STATION,

Agricultural College, Miss.

Mississippi Agricultural Experiment Station

BULLETIN No. 161.

COTTON EXPERIMENTS, 1912.

AGRICULTURAL COLLEGE, MISSISSIPPI.

FEBRUARY, 1913.

TUCKER PRINTING HOUSE JACKSON MISS

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Cotton Experiments, 1912.

Introduction.—This bulletin gives the results for 1912 of some of the cotton experiments in progress at the four Mississippi Experiment Stations. These are the Central Station at the A. & M. College, the McNeill Branch Station at McNeill, the Holly Springs Branch Station at Holly Springs, and the Delta Branch Station at Stoneville.

Most of the experiments reported have been in progress for several years and the results of these experiments up to the close of 1911 were published in Bulletin 155 of this Station. That bulletin may be had upon application to the Director of the Experiment Station, Agricultural College, Miss., and for that reason the results for the preceding years have not been included in this report except in a few instances. As in the case of Bulletin 155, the results from the different Stations are here reported separately.

Results from the Central Station.

By J. R. Ricks and E. C. Ewing.

THE WEATHER.

As indicated in Table No. 1, the rainfall for 1912 was very heavy, exceeding the average annual rainfall by over 20 inches. The continual raining throughout the spring and summer which occurred here and through the northeastern part of the state greatly injured the crop.

Table 1.—Rainfall for 1910, 1911, and 1912.

	1910		1911		1912	
	Total rain-fall inches.	No. of days on which rain fell.	Total rain-fall inches.	No. of days on which rain fell.	Total rain-fall inches.	No. of days on which rain fell.
January	4.07	6	5.47	10	4.90	10
February	3.80	9.	3.75	8	2.91	8
March	.93	2	1.45	5	9.41	14
April	3.02	6	10.07	12	13.20	19
May	2.62	5	1.92	3	4.68	13
June	4.49	12	5.88	12	6.95	20
July	8.67	14	6.24	18	6.77	20
August	1.42	6	5.10	18	7.47	18
September	.85	2	.20	6	5.05	7
October	2.76	5	2.18	7	5.20	6
November	1.93	5	4.28	12	1.00	3
December	3.00	10	11.83	18	8.96	16
Total	37.56	82	58.37	129	76.50	154

The average rainfall here for a period of ten years is approximately 52 inches.

VARIETY TEST.

The Variety Test was planted May 2nd, on a plat of rich land which is rather low and not very well drained. On this account the cotton suffered considerably from the excessive rains.

Earliness is an important factor in growing cotton in the presence of the boll weevil and the relative earliness of the different varieties

of cotton can be judged fairly well by comparing the weights of their first, second, and third pickings. Attention is called here to the superior yields secured at each Station from the earlier varieties, especially at the McNeill Station where the boll weevil was a factor of some importance, and at the Holly Springs Station and the Delta Station where the late planting favored the early varieties.

Boll weevils appeared here about September 1, but not in sufficient numbers to do any important damage to the crop that late in the season. For this reason the relative yields of the different varieties were probably not the same as they would have been under boll weevil conditions, although the early varieties, even though grown practically in the absence of boll weevils, seemed better adapted to the wet weather and rather fertile soil than the later and more vigorous growing varieties. Had boll weevils appeared in large numbers early in the season, the superiority of the early varieties would have been even more marked.

The total yield per acre secured from the different varieties as shown in the table was estimated from the yields of smaller plats, or rather parallel rows in repeated series.

The total money value per acre of the different varieties is calculated from the value of the seed per acre and the value of the lint per acre. The latter is determined by the length of the staple as well as by the yield of the lint. As not all markets in the eastern part of the state make a distinction in price on the basis of length of staple, the samples of this cotton were taken to Aberdeen, a near-by market where considerable long staple cotton is marketed and they were classed there by experts. Different values per pound were then assigned to the different varieties depending on the length of staple. As the grade does not depend much on the variety but more on the care taken in picking and handling the cotton, the same grade was assigned to all varieties, and as strict middling is about the average grade, the samples were valued on a strict middling basis.

In Delta markets and in such markets as Memphis and New Orleans where long staple and inch and an eighth cottons are marketed in larger quantities, and also where the cotton is usually of better character, somewhat better prices prevail for cotton of the same length than in Aberdeen, and readers are referred to the report from the Delta Station for the values on the same varieties grown at the Delta Station, the samples from that Station having been valued at a Delta market.

Table 2.—Variety Test, 1912.

	Lbs. Seed Cotton per acre, 1st picking.	Lbs. Seed Cotton per acre, 2d picking.	Lbs. Seed Cotton per acre, 3d picking.	Total lbs. Seed Cotton, per acre.	Percentage of Lint.	Pounds of Seed per Acre.	Pounds of Lint per Acre.	Length of Staple.	Value of Lint per lb. S. M. Grade, at Aberdeen, Dec. 21	Value of Lint per acre at the prices quoted.	Value of Seed per acre at $25.00 per Ton.	Total Value of Lint and Seed per acre.	Rank in Money Value per acre.
								Inches.	Cents.				
Dixie	575	580	471	1626	32	1106	520	1	12 5-8	$65.65	$13.82	$79.47	13
Covington-Toole. W. R.	524	547	427	1498	36	959	539	1	12 5-8	68.05	11.99	80.04	12
Brandon	747	612	241	1600	36	1024	576	1	12 5-8	72.72	12.80	85.52	8
Money Maker	588	537	241	1366	37	861	505	1 1-16	12 7-8	65.02	10.76	75.78	20
Hite	487	553	433	1473	35	957	516	1	12 5-8	65.14	11.96	77.10	17
Dodd's Prolific	933	498	212	1643	32	1117	526	1 1-16	12 7-8	67.72	13.96	81.68	9
90 Day	827	471	219	1517	33	1016	501	1 1-16	12 7-8	64.50	12.69	77.19	16
Simpkins	991	405	121	1517	35	996	521	7-8	12 5-8	65.78	12.45	78.23	14
Trice	1210	394	121	1725	30	1208	517	1 1-16	12 7-8	66.56	15.10	81.66	10
Hawkins	454	652	323	1429	32	972	457	1 1-16	12 7-8	58.84	12.15	70.99	25
World's Wonder	575	498	226	1299	30	900	390	1 1-16 f.	13 1-4	51.68	11.36	63.04	27
Ashcraft	701	449	400	1550	31	1070	480	1 1-16	12 7-8	61.80	13.37	75.17	23
Christopher	597	597	334	1528	32	1039	489	1 1-16 f.	13 1-4	64.79	12.99	77.78	15

Cook's Cook	821	591	307	1719	36	1100	619	7-8	12 5-8	78.15	13.75	91.90	3
Station Cook	630	662	356	1648	38	1022	626	3-4	12 5-8	79.03	12.77	91.80	4
Wannamaker's Cleveland	881	652	241	1774	37	1118	656	1	12 5-8	82.82	13.97	96.79	1
Cleveland's Cleveland	657	684	400	1741	35	1132	609	1 1-16	12 7-8	78.41	14.15	92.56	2
Station Cleveland	684	690	345	1719	35	1117	602	1 1-16	12 7-8	77.51	13.96	91.47	5
Triumph	657	602	305	1564	39	954	610	1 1-16	12 7-8	78.54	11.92	90.46	6
Russell	537	635	324	1496	31	1032	464	1 1-16 f.	13 1-4	61.48	12.90	74.38	24
Rowden	537	471	400	1408	33	943	465	1 1-8	13 3-4	63.93	11.79	75.72	21
Rowden 116	558	498	343	1399	33	937	462	1 1-8	13 3-4	63.52	11.71	75.23	22
Lone Star	646	542	346	1534	36	982	552	1 1-8	13 3-4	75.90	12.27	88.17	7
Nancy Cain	728	465	181	1374	31	848	426	1 1-8 f.	14	59.64	10.60	70.24	26
Columbia	547	537	257	1341	31	925	416	1 3-16	15 1-2	64.48	11.56	76.04	19
Foster	679	526	153	1376	31	949	427	1 3-16 f.	16 1-4	69.59	11.86	81.25	11
Sunflower	454	482	296	1232	28	877	355	1 5-16	18 1-2	65.67	10.96	76.63	18

f., full.

TYPE OF PLANT OF THE DIFFERENT VARIETIES.

1. **Dixie.**—Plants medium to large, similar to Peterkin type, bolls of medium size, foliage medium dense. This is the wilt resistant variety distributed by the U. S. Department of Agriculture.

2. **Covington-Toole Wilt Resistant.**—Plants small, of open form, Peterkin type, bolls small, foliage light, plants very uniform. This variety is also very resistant to the cotton wilt disease, or blight.

3. **Brandon, or Brannon.**—Plants small to medium, similar to Peterkin type although earlier than most of the Peterkin varieties, bolls small to medium, foliage light to medium dense.

4. **Money-Maker.**—Plants small, of Peterkin type, bolls small, foliage light, plants very uniform and similar to Covington-Toole.

5. **Hite.**—Plants small, similar to Peterkin type, bolls small, foliage light, lobes of leaves narrow, plants quite uniform, a late variety.

6. **Dodd's Prolific.**—A variety not uniform, consisting of a mixture of types, but plants most commonly resemble the King or early type, many of them having the purple petal spot in the bloom which is characteristic of that group, plants small to medium in size, boll small, foliage light.

7. **Ninety Day.**—This variety probably belongs to the King or Early group, but the plants are somewhat larger than the usual King type and the petal spot has been eliminated, probably by careful selection, bolls small, foliage light.

8. **Simpkins.**—Plants small and slender, bolls small, foliage light.

9. **Trice.**—Plants small to medium size, variety somewhat mixed many of the plants being of the semi-cluster type, bolls medium sized, foliage light, very early.

10. **Hawkins.**—Plants of the semi-cluster type, rather tall and compact, bolls medium sized, foliage medium dense.

11. **World's Wonder.**—Plants medium to large, usually of the semi-cluster type, foliage medium dense, bolls of medium size.

12. **Ashcraft Double Jointed Snowbank.**—Plants of the cluster or limbless type, tall, bolls clustered together on the short fruiting branches, bolls of medium size to large, leaves large.

13. **Christopher.**—A variety belonging to the big boll group, plants usually of the semi-cluster form, bolls large, foliage dense.

14. **Cook, or Cook's Improved.**—A variety of the big boll group, plants large and vigorous and frequently of semi-cluster form, bolls medium to large, foliage medium dense.

15. **Cook from Experiment Station.**—A distinct strain developed from the preceding by Prof. W. R. Perkins, plants smaller, of more

open form, uniformly of the same type, bolls medium to large, foliage medium dense.

16. **Wannamaker Pedigreed-Cleveland Big Boll.**—A distinct type developed from the Cleveland variety, of the big boll group but bolls smaller than in orginal Cleveland, plants smaller, of more open form, and uniformly of the same type, foliage medium to dense, appears in the table as Wannamaker's Cleveland.

17. **Cleveland, or Cleveland Big Boll.**—Big boll group, plants large and stocky, frequently tending toward the semi-cluster form, bolls large, foliage rather dense.

18. **Cleveland from Experiment Station.**—Practically identical with the above.

19. **Triumph.**—Big boll group, plants medium large, stocky, bolls very large, foliage dense.

20. **Russell.**—Big boll group, plant rather small and stocky, bolls rather large, foliage dense.

21. **Rowden.**—Big boll group, plants large and vigorous, bolls large, foliage medium dense.

22. **Rowden 116.**—Practically identical with the above.

23. **Lone Star.**—Big boll group, plant medium sized and stocky, bolls very large, foliage dense.

24. **Nancy Cain.**—Plants rather large and slender, of the long staple type, bolls small, foliage light.

25. **Columbia.**—A long staple variety but resembling the big boll group more than the old long staple varieties, plants rather small, stocky, and compact, bolls large, foliage dense.

26. **Foster.**—A long staple variety, resembling the big boll group but not so much as the Columbia, plants medium to large, bolls large, foliage medium dense.

27. **Sunflower.**—Long staple type, plants tall and slender, bolls small, foliage light.

The following is a list of the parties from whom seed of the varieties tested were obtained:

Dixie.—U. S. Department of Agriculture, Washington, D. C.
Covington-Toole Wilt Resistant.—W. F. Covington, Headland, Alabama.
Brandon.—W. P. Smith, Peoria, Miss.
Money Maker.—Alexander Seed Co., Augusta, Ga.
Hite.—W. T. Hite, Augusta, Ga.
Dodds' Prolific.—S. L. Dodds, Hickman, Ky.
Ninety Day.—J. G. Truitt, La Grange, Ga.

Simpkins.—W. A. Simpkins, Raleigh, N. C.
Trice.—West Tennessee Experiment Station, Jackson, Tenn.
Hawkins.—B. W. Hawkins, Nona, Ga.
World's Wonder.—J. E. Evans, Muldon, Miss.
Ashcraft Double Jointed Snowbank.—W. A. Corley, Kellyton. Alabama.
Christopher.—J. B. Sims, Newnan, Ga.
Cook.—J. R. Cook, Ellaville, Ga.
Cook from Experiment Station.—Mississippi Experiment Station.
Wannamaker Pedigreed-Cleveland Big Boll.—Wannamaker and Sons, St. Matthews, S. C.
Cleveland.—J. R. Cleveland, Decatur, Miss.
Triumph.—Mississippi Experiment Station.
Russell.—J. L. Thornton, Alexander City, Ala.
Rowden.—F. Hill, Wills Point, Texas.
Rowden 116.—Texas Seed Breeding Farms, Sherman, Texas.
Lone Star.—Mississippi Experiment Station.
Nancy Cain.—S. S. Johnson, Oxford, Miss.
Columbia.—Mississippi Experiment Station.
Foster.—D. A. Saunders, Waco, Texas.
Sunflower.—Marx Schaefer, Yazoo City, Miss.

RESULTS WITH FERTILIZERS.

Table 3.—Fertilizer Tests—Six Years.

	Fertilizer per Acre.	Yield of Seed Cotton—1907.	Yield of Seed Cotton.—1908.	Yield of Seed Cotton—1909.	Yield of Seed Cotton—1910.	Yield of Seed Cotton—1911.	Yield of Seed Cotton—1912.	Average total yield of Seed Cotton.
1	Kainit	1468	1940	1744	1352	904	952	1393
2	Acid Phosphate 288 lbs.	1540	1688	1352	1656	1120	904	1377
3	C. S. Meal 288 lbs.	1268	1376	832	1232	1016	856	1097
4	No Treatment	1280	1384	1240	1192	936	784	1136
5	Manure 4 tons Lime 800 [illegible] lbs.	1528	2432	1744	1528	1496	1336	1677
6	C. S. Meal 288 lbs. Kainit 288 lbs.	1664	1912	1616	1536	984	976	1448
7	C. S. Meal 288 lbs. Kainit 288 lbs. Acid Phposphate 288 lbs.	1760	1872	1592	1464	1064	1000	1459
8	Manure 8 tons	1736	2352	2440	1856	2152	1448	1981
9	Manure 4 tons Acid Phosphate 288 lbs.	1616	2032	1792	1592	1888	1048	1678
10	Manure 4 tons Kainit 288 lbs.	1440	2096	1680	1496	1536	1192	1573
11	Kainit 288 lbs. Acid Phosphate 288 lbs.	1296	1680	1624	1264	864	840	1219
12	C. S. Meal 288 lbs. Acid Phosphate 288 lbs.	1040	1382	1040	1048	1000	624	1022

Table 4.—Relative Earliness from Fertilizer Plats as Shown by the Different Pickings.

These plats are the same as those shown in the preceding table.

	FERTILIZERS PER ACRE.	Lbs. Seed Cotton per acre 1st picking.	Lbs. Seed Cotton per acre 2d Picking.	Lbs. Seed Cotton per acre 3d picking.	Lbs Seed Cotton per acre 4th Picking.	Total yield Seed Cotton per acre.
1	Kainit 288 lbs.	192	440	216	104	952
2	Acid Phosphate 288 lbs.	208	400	216	80	904
3	C. S. Meal 288 lbs.	176	320	272	88	856
4	No Treatment	128	312	240	104	784
5	Manure 4 tons Lime 800 lbs.	160	536	520	120	1336
6	C. S. Meal 288 lbs. Kainit 288 lbs.	224	440	224	88	976
7	C. S. Meal 288 lbs. Kainit 288 lbs. Acid Phosphate	248	384	256	112	1000
8	Manure 8 tons	264	616	384	184	1448
9	Manure 4 tons Acid Phosphate 288 lbs.	200	440	224	184	1048
10	Manure 4 tons Kainit 288 lbs.	192	456	352	192	1192
11	Kainit 288 lbs. Acid Phosphate 288 lbs.	96	272	320	152	840
12	Acid Phosphate 288 lbs.	184	272	128	40	624

Table 5.—Manure and Kainit to Prevent Rust, 1911 and 1912.

PLAT.	1911. 1st picking—lbs. Seed Cot. per acre	1911. 2nd picking—lbs. Seed Cot. per acre	1911. 3rd picking—lbs. Seed Cot. per acre	1911. 4th picking—lbs. Seed Cot. per acre	1911. Total yield—lbs. Seed Cot. per acre	1912. 1st Picking—lbs. Seed Cot. per acre	1912. 2nd picking—lbs. Seed Cot. per acre	1912. 3rd Picking—lbs. Seed Cot. per acre	1912. Total yield—lbs. Seed Cot. per acre
Manure 10 tons per acre	693	1026	458	90	2267	1268	976	412	2656
Kainit 400 lbs. per acre	403	845	377	90	1715	896	808	276	1890
No treatment	661	539	200	74	1474	524	320	56	900

In the above the manure was applied in the spring of 1911. No additional manure was added in 1912; 400 pounds of kainit were added each year.

An application of from 200 to 400 pounds of kainit to land on which cotton rusts badly is usually profitable. We do not get profitable results from potash here on soils where cotton does not rust.

Results from Kainit in 1910.

PLAT.	1st Picking lbs. Seed Cotton per acre.	2d Picking lbs. Seed Cotton per acre.	Total Yield lbs. Seed Cotton per acre.
Kainit 200 lbs per acre	722	1266	1989
No treatment	1178	722	1900

DISTANCE EXPERIMENTS.

Table 6.—Width of Rows.

Results in 1912.

PLAT.	Average Height.	1st picking, lbs. Seed Cotton per acre.	2d. picking, lbs. Seed Cotton per acre.	3d picking lbs. Seed Cotton per acre.	Total yield lbs. Seed Cotton aper cre.
5 ft. rows	5	400	447	251	1098
4½ ft. rows	5	389	465	327	1181
4 ft. rows	5	354	545	254	1153
3½ ft. rows	5	502	483	265	1250
3 ft. rows	5	560	422	254	1236

Results in 1911.

PLAT.	Average Height.	1st Picking, lbs. Seed Cotton per Acre.	2d Picking, lbs. Seed Cotton per Acre.	Total Yield lbs. Seed Cotton per Acre.
5 ft. rows	4½	922	309	1231
4½ ft. rows	4½	907	439	1346
4 ft. rows	4½	911	413	1324
3½ ft. rows	4½	1063	425	1488
3 ft. rows	4½	1100	526	1626

Results in 1909 and 1910.

PLAT.	Yield of Seed Cotton per Acre, 1909.	Yield of Seed Cotton per Acre, 1910.
6 ft. rows	1930 lbs.	1661 lbs.
5 ft. rows	2049 lbs.	2087 lbs.
4 ft. rows	2175 lbs.	

In the above, plants stood at an average of fifteen inches in the drill, and grew to an average height of about 4 1-2 feet.

Table 7.—Distances in the Drill for 1910, 1911, and 1912.

PLAT.	1910			1911				1912		
	1st picking—Lbs. Seed Cotton per acre	2d picking—Lbs. Seed Cotton per acre	Total yield—Lbs. Seed Cotton per acre	1st picking—Lbs. Seed Cotton per acre	2d picking—Lbs. Seed Cotton per acre	3d picking—Lbs. Seed Cotton per acre	Total yield—Lbs. Seed Cotton per acre	1st picking—Lbs. Seed Cotton per acre	2d picking—Lbs. Seed Cotton per acre	Total yield—Lbs. Seed Cotton per acre
12 inches	1796	566	2362	812	583	73	1468	658	674	1332
20 inches	1454	621	2075	771	581	62	1414	626	638	1264
30 inches	1202	666	1868	698	554	48	1300	540	436	976

In the above experiment the rows were 3 feet, 8 inches apart and the cotton grew to about 4 1-2 feet in height.

Table 8.—Topping Cotton.

Results in 1912.

PLAT.	1st Picking: lbs. Seed Cotton per Acre.	2nd Picking: lbs. Seed Cotton per Acre.	Total Yield: lbs. Seed Cotton per Acre.
Topped July 15th	642	432	1074
Topped August 1st	546	606	1152
Not topped	606	534	1140

Results in 1911.

PLAT.	1st Picking: lbs. Seed Cotton, per Acre.	2d. Picking: lbs. Seed Cotton, per Acre.	3d. Picking: lbs. Seed Cotton, per Acre.	Total Yield: lbs. Seed Cotton, per Acre.
Topped July 15th	995	825	181	1931
Topped August 1st	675	919	194	1788
Not topped	744	850	162	1756

Results in 1910.

PLAT.	1st Picking: lbs. Seed Cotton, per Acre.	2nd Picking: lbs. Seed Cotton, per Acre.	Total Yield: lbs. Seed Cotton, per Acre.
Topped July 23rd	1479	187	1666
Topped August 5th	1567	185	1752
Not topped	1593	228	1821

Results in 1909.

PLAT.	1st Picking: lbs. Seed Cotton, per Acre.	2nd Picking: lbs. Seed Cotton, per Acre.	3rd Picking: lbs. Seed Cotton, per Acre.	Total Yield: lbs. Seed Cotton, per Acre.
Topped August 1st	888	316	376	1580
Not topped	792	256	416	1464

Results in 1907.

PLAT.	Yield Seed Cotton—Per Acre.
Topped August 3rd	1808
Not topped	1575
Topped August 26th	1780
Not topped	1821

Results from McNeill Branch Station, 1912.

By E. B. Ferris.

Introduction.—For two years previous to 1912 it has been next to impossible to grow cotton in this section on account of the ravages of the boll weevil. In fact, this part of Pearl River County was never a good cotton country on account of the excessive summer rainfall which causes the cotton to shed its fruit badly and also causes fungous diseases to spread with great rapidity. Even before the coming of the boll weevil the shedding of the squares and the ravages of anthracnose made cotton yields here very unsatisfactory and with the weevil as bad as it was in 1910 and 1911, the people here soon stopped planting cotton entirely. Last year less than forty bales of cotton were grown in this county and in 1912 not a cotton gin is being run in the county, and this Station has not been able to gin the cotton grown here. The weevil reached McNeill in September 1909, and did considerable damage to late cotton that year. In 1910 and 1911 we made every effort to grow cotton successfully in the presence of the boll weevil by catching the first weevils as they appeared in the spring, picking up the fallen squares, early planting the use of proper fertilizers, destroying the stalks in the fall, and by all other known means of destroying the weevils or of keeping them in check. In spite of this, cotton yields were ridiculously small, and while we continued to grow cotton in 1912, we doubt if as much as fifty acres of land have been planted to cotton this year in the entire county.

Results with cotton in 1912, however, have been very encouraging here. Practically no weevils appeared here this year before August and while we looked for them closely in spring and early summer, we were never able to find but a single weevil, whereas, in the two previous years at the same time we were finding hundreds of them. The scarcity of the weevils this year may have been due to the fact that the cotton army worms last year destroyed all foliage as early as the first of September and that we cleaned up the premises very thoroughly in the fall, burning off all fence rows and fall breaking the most of the land, also to the fact that the cotton here last year was the only cotton grown within a radius of ten miles, perhaps, of McNeill. However, we cannot think this was entirely responsible for the scarcity of the weevils this year and must believe that after an infestation of a few years natural causes serve to make the weevils less active. So far as we are able to find out, the cotton army worms destroyed the cotton foliage last year in sections north of us as thoroughly as they did here, but the weevils having appeared there from one to two years later than they did at

McNeill, these natural enemies were not so active. and we find the ravages of the weevil almost as bad with them this year as with us in 1910 and 1911. On this Station this year cotton yields have been as good as they ever were before the coming of the weevil and we know of a few patches grown by other people this year in this immediate vicinity where the yields were also very satisfactory. We think results here this year with cotton will encourage a good many farmers to begin growing cotton again in a small way.

Tests with varieties.—In 1912 thirty-one varieties of cotton were tested here in connection with similar work with the same varieties at the other stations in the state. These varieties were planted on a plat of land of very uniform composition and representative of very best type of pine soil reasonably well improved. However, experience here has taught us that it is impossible to divide any plat of land into a large number of equal parts of equal productiveness. In order to do away in this instance with variations in yield due to the inequalities of the soil, these varieties were planted on single rows of one-eightieth acre each and these distributed uniformly over the area devoted to the work, giving four rows to each variety. The land on which this cotton was planted was flat broken in the fall, laid off into rows four feet apart in March and fertilized at once with a mixture of two parts of high grade acid phosphate and one part of cottonseed meal at the rate of three hundred pounds per acre of the mixture. This fertilizer was mixed in the drill with a scooter plow and then bedded upon, the beds being afterwards harrowed down almost flat. On April 8th and 9th these varieties of cotton were planted with a Ledbetter one-seed planter and came up promptly to a perfect stand. On June 14th this cotton was seriously attacked by the Southern Army, or Southern Grass Worm, that appeared about that time all over this section and destroyed hundreds of acres of crops of almost every kind grown here. All sorts of means were used to destroy these worms but they appeared in such numbers and were so hard to kill we were compelled to hand pick this cotton in order to save it at all. This was done three times and they were caught and destroyed by the gallon. At the same time very thorough search was made for boll weevils with the result, as previously stated, that none were found of any consequence.

In conducting this work with varieties the plat of land used, which was rectangular in shape and about four times as long as it was wide, was divided length ways into four divisions and one row in each division planted to each of the thirty-two varieties of cotton. On May 15th, two of these divisions were given a top dressing of nitrate of soda at the rate of one pound per row or 80 pounds per acre with the result that

the two plats without the nitrate yielded at the rate of 1,077 pounds of seed cotton per acre and the two plats with the nitrate at the rate of 1,226 pounds per acre. On account of the attack of the grass worms the stand of this cotton was considerably broken and in giving the result of yields we have also figured them as based on a perfect stand. On the basis of a perfect stand the above yields would have been 1,346 pounds of seed cotton per acre without the nitrate and 1,592 pounds per acre with it.

The following table gives these results in detail:

Table 9.—Variety Test.

	NAME OF VARIETY.	Lbs. of Seed Cotton, per 1-20 Acre Plat: Sept. 9.	Lbs. of Seed Cotton, per 1-20 Acre Plat: Oct. 10.	Lbs. of Seed Cotton, per 1-20 Acre Plat: Oct. 23.	Total lbs. Seed Cotton, per Plat.	Calculated lbs. Seed Cotton, per acre.	Lbs. Seed Cotton per acre, perfect stand, calculated.
1	Dixie	29.5	24.5	13.0	67.0	1340	1340
2	Covington-Toole	23.0	25.5	15.0	63.5	1270	1594
3	Brandon	19.0	19.5	10.0	48.5	970	1616
4	Money Maker	24.0	30.0	14.0	68.0	1360	1360
5	Dodd Prolific	32.0	24.0	11.5	67.5	1350	1800
6	Truitt's 90-day	33.5	27.5	10.5	71.5	1430	1430
7	Hite	26.5	30.0	14.0	70.5	1410	1468
8	Simpkins	36.0	28.5	10.5	75.0	1500	1785
9	Trice	40.5	29.0	13.0	82.5	1650	1896
10	Hawkins	11.5	26.5	21.0	59.0	1180	1738
11	World's Wonder	11.0	32.5	21.0	64.5	1290	1573
12	Ashcraft's D. J. Snowbank	12.0	22.5	17.5	52.0	1040	1793
13	Christopher's Improved	5.0	23.0	18.5	46.5	930	1328
14	Cook from J. R. Cook	11.5	20.5	16.0	48.0	960	1655
15	Cook from Station	16.5	32.5	26.5	75.5	1510	1887
16	Cleveland f'm Wannamaker	13.0	23.5	18.5	55.0	1100	2391
17	Cleveland from Cleveland	10.0	21.0	21.5	52.5	1050	1500
18	Cleveland from Station	9.5	21.5	22.5	53.5	1070	1783
19	Triumph	5.5	19.5	22.5	47.5	950	1557
20	Rowden	12.0	21.5	20.0	53.5	1070	1597
21	Rowden 116	11.0	19.0	16.0	46.0	920	1082
22	Lone Star	12.0	21.5	13.0	46.0	920	1243
23	Russell's Big Boll	7.5	19.5	22.0	49.0	980	1689
24	Columbia	8.0	15.5	17.5	41.0	820	1301
25	Foster	15.5	28.5	12.5	56.5	1130	1334
26	Sunflower	18.0	19.5	12.0	49.5	990	990
27	Nancy Cain	17.5	24.5	10.0	52.0	1040	1181
28	Broadwell's Double Jointed	35.0	27.0	10.5	72.5	1450	1542
29	Sproull	9.0	16.0	14.5	39.5	790	1067
30	King's Improved	38.0	26.0	9.0	73.0	1460	1505
31	Barber's Big Boll Prolific	22.0	23.5	11.5	57.0	1140	1295

Tests with Fertilizers Under Cotton in 1912.

Thirty plats of land of one-twentieth acre each that had been fertilized the same way for a number of years, were used for this work, and all had been planted to corn and cowpeas the year before. Each

test was made in triplicate and the plats fertilized the same way were so distributed over the entire acreage devoted to the work as to make the average results much more reliable than single plats would have done.

In addition to this work with fertilizers under cotton, four plats were used on the parked area where cattle had been fed ten years ago and these four plats were fertilized in two different ways, the tests being made in duplicate. A glance at the results as given below will show that the effects of the manure from these cattle are still quite perceptible.

Table 10.—Fertilizer Test.

No. of Plat.	Cotton-Seed Meal.	Acid Phosphate.	Kainit.	Ammonium Sulphate.	Lime and Acid Phosphate Mixture P_2O_2 (Reacted)	Yield of Seed Cotton calculated in lbs. per acre.
1	0	0	0	0	0	233
2	200	0	0	0	0	538
3	0	200	0	0	0	846
4	0	0	200	0	0	480
5	200	200	0	0	0	744
6	200	200	200	0	0	764
7	400	200	0	0	0	922
8	200	400	0	0	0	730
9	0	400	0	80	0	730
10	200	0	0	0	800	860
11	200	200	0	Parked Land		1055
12	200	200	200	Parked Land		1135

The land on which this work was done had been broken in the fall and laid off into rows three and three-quarters feet apart in March. On March the nineteenth the above fertilizers were distributed in furrows and mixed with a scooter plow, after which the beds were completed. On April the fourth, these beds were harrowed down almost flat and on April the sixth, Triumph cotton seed, bought of T. W. Wade, of Alexander City, Alabama, were planted with a Ledbetter one seed planter. They came up promptly to a perfect stand and while injured some by the Southern grass worm, the stand remained almost perfect.

While the boll weevil was present during the latter part of the season, they did very little damage, and came at a time when daily rains made it almost impossible to combat them successfully.

Late cotton.—A small plat of land was planted here on June the fifteenth to two varieties of cotton to test the effects of late planting on yields. The weevils appeared in great quantities in late August when it was raining every day and we could do nothing to effectively stop them and they destroyed most of the forms that were put on. The yields of seed cotton gathered per acre were ninety-six pounds from King, and eighty-eight pounds from Triumph.

Results from Holly Springs Branch Station.

By C. T. Ames.

Table 11.—Variety Test.

No. of Plat.	VARIETIES.	Dates of Pickings.		Total.	Seed Cotton per acre.	Per Cent of Lint.	Length of Staple	Yield Lint per acre.	Yield Seed per acre.	Total Value per acre.
		Oct. 13	Nov. 30.							
1	Dixie	24	43	67	804	32%	1 inch	257.2	547	$39.58
2	Covington-Toole: Wilt Resistant	20.5	37.5	58	696	36%	1	250.5	445	37.39
3	Brandon	39	49	88	1056	36%	1	380	676	56.57
4	Money Maker	24	43.5	67.5	810	37%	1 1-16	299.7	510	45.19
5	Dodds' Prolific	50	52	102	1224	32%	1 1-16	391.6	832	61.23
6	Truitt's 90 Day	44	53	97	1164	33%	1 1-16	384	780	59.58
7	Hite	24	36	60	720	35%	1	252	468	37.89
8	Simpkins	58.5	57	115.5	1386	35%	7-8	485	901	72.94
9	Trice	73	57.5	130.5	1566	30%	1 1-16	469.8	1096	74.72
10	Hawkins	24	44	68	816	32%	1 1-16	261.5	555	40.77
11	World's Wonder	36.5	51.5	88	1056	30%	1 1-8	316.8	739	53.15
12	Ashcraft Double Jointed	30	62.5	82.5	990	31%	1 1-16	306.9	683	48.38
13	Christopher	32	51.5	83.5	1002	32%	1 1-16	320.6	682	51.33
14	Cook from Cook	36	42	78	936	36%	7-8	336.9	599	50.30

15	Cook from Station	32	43	75	900	38%	3-4	342	558	50.42
16	Cleveland from Wannamaker	55	51	106	1272	37%	1	470.6	801	69.68
17	Cleveland from Cleveland	38	42.6	80.5	966	35%	1 1-16	338	628	52.94
18	Cleveland from Station	32	47	79	948	35%	1 1-16	331.8	617	50.72
19	Triumph	35	39.5	74.5	894	39%	1 1-16	348.6	545	51.97
20	Rowden	29	34.5	63.5	762	33%	1 1-8	251.4	511	45.60
21	Rowden 116	27.5	38	65.5	786	33%	1 1-8	259.3	526	47.01
22	Lone Star	32.5	47	79.5	954	36%	1 1-8	343.4	611	55.15
23	Russell Big Boll	24	47.5	71.5	858	31%	1 1-16	265.9	592	41.92
24	Columbia	26	40.5	66.5	798	31%	1 3-16	247.3	551	45.48
25	Foster	27	38.5	65.5	786	31%	1 3-16	243.6	542	44.80
26	Sunflower	16	29.5	45.5	546	28%	1 1-4	152.8	393	32.21
27	Nancy Cain	31	43.5	74.5	894	31%	1 1-8	277	617	46.10

Remarks.—The samples were classed December 21, by Mr. J. G. Higgins and Mr. I. I. Jones, at Aberdeen, Miss. Valuation on different staples made on strict middling basis, on closing quotations for Janauary at New Orleans.

1 inch, .12 5-8 cts.; 1 1-8 inch full, .14 cts.; 1 5-16 inch, .18 1-2 cts.
1 1-16 inch, .12 7-8 cts.; 1 3-16 inch, .15 1-2 cts.; 1 3-8 inch, .20 cts.
1 1-16 full, .13 1-4 cts.; 1 3-16 inch full, .16 1-4 cts.; 1 7-16 inch, .22 cts.
1 1-8 inch, .13 3-4 cts.; 1 1-4 inch, .17 3-4 cts.

This cotton was planted May 16th, and on account of this late planting the relative earliness of the different varieties affected their yields more than any other factors. The test was located in a brown loam valley, the plats consisting of one row of each variety. These were repeated six times making a total of one-twentieth acre of each variety. The season was very wet.

Table 12.—Fertilizer Test with Cotton.

Number of Plat.	KIND AND QUANTITY OF FERTILIZER USED.	Dates of Pickings.				Total lbs. Seed Cotton.	Pounds of Seed Cotton per acre.	Value at 4 cents per Pound.
		October 2.	October 17.	November 5.	December 15.			
1	No Fertilizer	0	1	3	5	9	180	$ 7.20
2	200 lbs. Cottonseed Meal	1	3	6	5.5	15.5	310	12.40
3	200 lbs. Acid Phosphate	2	7	8	8	25	500	20.00
4	200 lbs. Kainit	1	3	4	7	15	300	12.00
5	No Fertilizer	1	2	4	5	12	240	9.60
6	200 lbs. Rock Floats	3	5	8	7	23	460	18.40
7	400 lbs. Rock Floats	3	7	9	10	29	580	23.20
8	200 lbs. Acid Phosphate	4	9	8	5.5	26.5	530	21.20
9	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	3	9	9	10.5	31.5	630	25.20
10	100 lbs. Cottonseed Meal 100 lbs. Rock Floats	2	10	11	11	34	680	27.20
11	No Fertilizer	2	3	5	6	16	320	12.80
12	100 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	3	8	8	7	26	520	20.80
13	200 lbs. Acid Phosphate	2	5	8	8	23	460	18.40
14	400 lbs. Rock Floats	1	7	8	11	27	540	21.60
15	200 lbs. Kainit	2	6	8	10	26	520	20.80
16	No Fertilizer	2	3	6	9	20	400	16.00

Soil.—Rolling hill land, of brown loam character.
Variety.—Cleveland Big Boll.
Planted—May 15, and replanted May 28, 1912.
Area of Plats.—One-twentieth acre each.

Table 13.—Fertilizer Tests with Cotton.

No. of Plat.	200 lbs. Fertilizer Per Acre.	Lbs. Seed Cotton per plat. Oct. 2.	Oct. 17.	Nov. 5.	Dec. 15.	Total lbs. Seed Cotton	Amount of Seed Cotton per acre.	Value at 4 cents per pound.
1	No Fertilizer	1	2	5	7	15	300 lbs.	$12.00
2	200 lbs. Cottonseed Meal	3	7	8	12	30	600 lbs.	24.00
3	200 lbs. Acid Phosphate	4	9	9	11.5	33.5	670 lbs.	28.80
4	200 lbs. Kainit	1	6	6	10	23	460 lbs.	18.40
5	No Fertilizer	1	3	4	8	16	320 lbs.	12.80
6	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	4	11	9.5	12	36.5	730 lbs.	29.20
7	100 lbs. Cottonseed Meal 100 lbs. Kainit	3	7	8	13	31	620 lbs.	24.80
8	100 lbs. Acid Phosphate 100 lbs. Kainit	4	9	9	13	35	700 lbs.	28.00
9	120 lbs. Acid Phosphate 40 lbs. Cottonseed Meal 40 lbs. Kainit	5	9	8	12	34	680 lbs.	27.20
10	No Fertilizer	0	2	3	6.5	11.5	230 lbs.	9.20
11	150 lbs. Cottonseed Meal 50 lbs. Acid Phosphate	4	7	6.5	8	25.5	510 lbs.	20.40
12	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	5	7	8	9	29	580 lbs.	23.20
13	50 lbs. Cottonseed Meal 150 lbs. Acid Phosphate	4	9	8	10	31	620 lbs.	24.80
14	No Fertilizer	0	3	5	8	16	320 lbs.	12.80

No. of Plat.	400 lbs. Fertilizer Per Acre.	Lbs. Seed Cotton per plat. Oct. 2.	Oct. 17.	Nov. 5.	Dec. 15.	Total lbs. Seed Cotton	Amt. Seed Cot. p'r acre	Value at 4 cents per pound.
6½	200 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	5	14	13	12	44	880	$35.20
7½	200 lbs. Cottonseed Meal 200 lbs. Kainit	2	8	11	15.5	36.5	730	29.20
8½	200 lbs. Acid Phosphate 200 lbs. Kainit	4	10	10	13.5	37.5	750	30.00
9½	240 lbs. Acid Phosphate 80 lbs. Cottonseed Meal 80 lbs. Kainit	6	11	10	12	39	780	31.20
10½	No fertilizer	0	2	4	7.5	13.5	270	10.80
11½	300 lbs. Cottonseed Meal	4	10	12	15	41	820	32.80
12½	200 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	4	8	10	13	35	700	28.00
13½	100 lbs. Cottonseed Meal 300 lbs. Acid Phosphate	4	7	7	7	25	500	20.00
14½	No Fertilizer	0	6	5.5	7.5	19	380	15.20

Variety.—Cleveland Big Boll. Planted May 15, and replanted May **28, 1912.**

Soil.—Rolling hill land, of brown loam character.

Plats.—One-twentieth acre each.

The above plats are located in the field in the order indicated in this table.

Each plat represented in this table has been fertilized seven years in succession, with the same kind and quantity of fertilizer as shown in table

Remarks.—All of the fertilizer plats planted to cotton were planted very late on account of the very rainy weather in the spring.

Conclusions.—The use of both nitrogen and phosphorous, either alone or in combination, has given very satisfactory results. Phosphorous hastens maturity.

The use of potash, either alone or in combination with the other elements, appears to be unnecessary in these soils.

On thin uplands, the use of an equal mixture of cottonseed meal and acid phosphate, at the rate of 200 lbs. to 300 lbs. per acre, should give very satisfactory results.

On the more fertile soils the quantity of acid phosphate may be increased to advantage.

After leguminous crops, phosphate alone at the rate of 200 lbs. to 300 lbs. per acre, can be used with profit.

Where leguminous crops are to be grown, from 300 lbs. to 400 lbs. of rock floats can be used to advantage. Where rock floats is mixed with manures, the result is very satisfactory.

Results from the Delta Branch Station.

By G. B. Walker.

Variety Test.

In the following table is given a list of forty-three varieties of cotton tested at the Delta Branch Experiment Station during 1912, with data which give the showing made by each variety. The fact that this test was made on overflowed land, planted as late as June 7th, should make it of great interest to cotton planters throughout the Delta.

The land on which this test was made is characteristic Deer Creek sandy loam soil, being only fairly well surface drained and not highly improved. No fertilizer at all was used. The land grew cotton the previous year.

This land was plowed into beds four feet wide the last week of March, and was not rebedded after the overflow waters receded. A one-horse "Planet Jr." cultivator and section harrow were used to prepare the beds for planting.

One row of each variety was planted in the order in which the varieties appear in the table, and in this order repeated four times. The planting was done in this manner to obviate any variations in the soil. There was an area of four twenty-sixths of an acre planted in each of the varieties and our yields are computed on this basis.

Samples of lint cotton from each of the varieties were classed by J. G. Higgins and I. I. Jones, of Aberdeen, Miss., and J. D. Winter and E. W. Wood, of Leland, Miss., and our valuations are made from information furnished by these gentlemen. The Experiment Station is greatly indebted to the above named gentlemen for the assistance rendered by them.

Table 14.—Variety Test.

VARIETY.	Date of Planting.	Character of foliage.	Lbs. Seed Cotton per acre 1st pick'g	Yield Seed Cotton per acre, 2d pick'g	Total Yield Seed Cotton per acre.	Yield Lint Cotton per acre.	Percentage of Lint	Length of Staple According to Leland Classification	Character of Lint.	Price per lb., strict middling grade.	Value of Lint Cotton per acre.	Value of Seed per acre at $20.00 per ton.	Total Value of Lint and Seed per acre.	Rank in Money Value per acre.
Dixie	June 7	Light	528	658	1186	379	32%	1	Fairly Good	12¾	$48.32	$ 8.07	$56.39	28
Covington-Toole *	June 7	Light	476	416	892	321	36%	7-8	Poor	12½	40.12	5.71	45.83	41
Brandon	June 7	Light	572	459	1031	360	35%	7-8	Poor	12½	45.00	6.71	51.71	34
Money Maker	June 7	Light	719	468	1187	427	36%	1 1-16	Fairly Good	13¼	56.57	7.60	64.17	17
Dalrymple	June 7	Medium	624	615	1239	420	34%	1 1-8	Good	14½	60.90	8.18	69.08	10
Dodd's Prolific	June 7	Light	1196	433	1629	521	32%	1 1-16	Good	13¼	69.03	11.08	80.11	2
Truitt's 90 Day	June 7	Light	875	372	1247	411	33%	7-8	Poor	12½	51.37	8.36	59.73	23
Hite	June 7	Light	598	312	910	318	35%	1	Poor	12¾	40.54	5.92	46.46	40
Simpkins	June 7	Light	944	260	1204	409	34%	3-4	Poor	12½	51.12	7.95	59.07	24
Trice	June 7	Light	1326	390	1716	514	30%	c. 1 1-8	Fairly Good	13¾	70.67	12.02	82.69	1
Rublee	June 7	Light	684	546	1230	405	33%	1 1-16	Fairly Good	13⅓	53.66	8.25	61.91	20
Hawkins' Prolific	June 7	Light	572	416	988	316	32%	1	Fairly Good	12¾	40.35	6.72	47.07	37
World's Wonder	June 7	Medium	728	455	1183	354	30%	c. 1 1-8	Fairly Good	13¾	48.67	8.29	56.96	27
Ashcraft's D. J. S. B.	June 7	Medium	901	611	1512	483	32%	1 1-16	Fairly Good	13¼	63.99	10.29	74.28	4
Christopher's Improved	June 7	Dense	615	624	1239	396	32%	1	Poor	12¾	50.49	8.43	58.92	26
Cook's Cook	June 7	Dense	520	520	1040	374	36%	3-4	Poor	12½	46.75	6.66	53.41	30
Station Cook	June 7	Dense	520	468	988	365	37%	3-4	Poor	12½	45.62	6.23	51.85	32
Brown's No. 1	June 7	Dense	520	481	1001	340	34%	1 1-16	Poor	13¼	45.05	6.61	51.66	35
Wannamaker-Cleveland	June 7	Dense	875	468	1343	496	37%	1	Fairly Good	12¾	63.24	8.48	71.71	6
Cleveland's Cleveland	June 7	Dense	702	572	1274	445	35%	1 1-16	Fairly Good	13¼	58.96	7.29	66.25	13
C. Station Cleveland	June 7	Dense	676	507	1183	414	35%	c. 1 1-8	Good	13¾	56.92	7.69	64.61	15
D. Station Cleveland	June 7	Dense	641	494	1135	385	34%	c. 1 1-8	Fairly Good	13¾	52.93	7.50	60.43	21
Day	June 7	Dense	589	481	1070	342	32%	c. 1 1-8	Fairly Good	13¾	47.02	7.28	54.30	29
Crawford's B. B.	June 7	Dense	745	427	1172	386	33%	1 1-16	Fairly Good	13¼	51.14	7.86	59.00	25
Pride of Georgia	June 7	Dense	832	468	1300	390	30%	c. 1 1-8	Fairly Good	13¾	53.62	9.10	62.72	19
Station Triumph	June 7	Dense	390	392	782	304	39%	c. 1 1-8	Good	13¾	41.80	4.78	46.58	39

* Wilt resistant. c., Commercial. f., Full.

Table 14—Variety Test—Continued.

VARIETY.	Date of Planting.	Character of foliage.	Lbs. Seed Cotton per acre 1st pick'g	Yield Seed Cotton per acre, 2d pick'g	Total Yield Seed Cotton per acre.	Yield Lint Cotton per acre	Percentage of Lint	Length of Staple According to Leland Classification	Character of Lint.	Price per lb., strict middling grade.	Value of Lint Cotton per acre.	Value of Seed per acre at $20.00 per ton.	Total Value of Lint and Seed per acre.	Rank in Money Value per acre.
Gholston's Triumph	June 7	Dense	832	546	1378	440	32%	c. 1 1-8	Fairly Good	13¾	60.50	9.38	69.88	8
Rowden	June 7	Dense	416	485	901	297	33%	c. 1 1-8	Fairly Good	13¾	40.83	6.04	46.87	38
Rowden 116	June 7	Dense	494	520	1014	334	33%	c. 1 1-8	Fairly Good	13¾	45.92	6.80	52.72	31
Lone Star	June 7	Dense	390	338	728	254	35%	f. 1 1-8	Good	15¼	38.73	4.74	43.47	43
Russell B. B.	June 7	Dense	520	481	1001	310	31%	1 1-16	FairlyGood	13¼	41.07	6.91	47.98	36
Columbia	June 7	Dense	754	364	1118	315	31%	1 1-4	Good	19½	61.42	8.03	69.45	9
Webber	June 7	Dense	416	554	970	291	30%	1 1-4	Good	19½	56.74	6.79	63.53	18
Keenan	June 7	Dense	303	416	719	215	30%	f. 1 3-16	Good	18½	39.77	5.04	44.81	42
Foster	June 7	Light	650	338	988	306	31%	f. 1 1-4	Good	20	61.20	6.82	68.02	11
Sunflower	June 7	Light	910	234	1144	308	27%	1 1-2	Good	23	70.84	8.36	79.20	3
Nancy Cain	June 7	Light	736	338	1074	322	30%	f. 1 3-16	Good	18½	95.57	7.52	67.09	12
Allen's Unknown	June 7	Light	730	442	1172	351	30%	f. 1 3-16	Good	18½	64.93	8.21	73.14	5
Scharborough	June 7	Light	780	338	1118	301	27%	1 3-8	Good	20¾	62.45	8.17	70.62	7
Latimer's Pride	June 7	Light	554	390	944	254	30%	1 3-8	Good	20¾	52.90	6.90	59.80	22
Durango	June 7	Light	702	286	988	316	32%	f. 1 3-16	Good	18½	58.46	6.72	65.18	14
Dodd's Long Staple	June 7	Light	728	364	1092	305	28%	f. 1 3-16	Good	18½	56.42	7.87	64.29	16
Thornton	June 7	Light	563	208	771	223	29%	1 3-8	Good	20¾	46.27	5.48	51.75	33

c., Commercial. f., Full.

Spacing Test.

In the following table is given results of spacing test with cotton at the Delta Branch Experiment Station during 1912.

The land where this test was made was broken flat the first week of March, and after the overflow waters had receded was disced and harrowed and planted level in rows three, three and one-half, four, five, and six feet apart the 6th of June. When the cotton was large enough to thin, the plants on one-third of the rows of the different widths were thinned to one foot in drill, one-third to two feet, and one-third to three feet. One-seventh acre was planted to each width of row and width of hills in drill, and our yields are computed on this basis.

Rublee cotton was used in this test, which is a variety of the semi-cluster type.

Table No. 15.—Spacing Test.

Width of Rows.	Date of Planting.	Pounds Seed Cotton per acre, plants 1 foot in drill.	Pounds Seed Cotton per acre, plants 2 feet in drill.	Pounds Seed Cotton per acre, plants 3 feet in drill.
3	June 6th	532	602	539
3½	June 6th	840	938	735
4	June 6th	854	840	742
5	June 6th	770	686	560
6	June 6th	504	448	427

AVAILABLE BULLETINS AND CIRCULARS.

The following bulletins and circulars of the Station may be had on request:

No. BULLETINS.

84—Report of Field Work at the College Station for 1903.
90—San José Scale.
92—Beef Cattle.
93—Peach and Plum Culture.
94—Report of Work at McNeill Branch Station for 1905.
104—Inspection and Analyses of Cottonseed Meal.
107—Pork Production at the Delta Station.
121—Experiment in Feeding Beef Steers.
122—Report of Work at the Holly Springs Branch Station for 1908.
139—The Boll Weevil in Mississippi, 1909.
140—Cotton Diseases in Mississippi.
141—Control of Diseases of Fruits, Flowers, and Vegetables.
143—Inspection and Analyses of Cottonseed Meal.
144—Inspection and Analyses of Commercial Feeding Stuffs.
145—Inspection and Analyses of Conmmercial Feeding Stuffs.
146—Suggestions for Growing Home Fruits.
147—Apple Growing in Mississippi.
148—Inspection and Analyses of Cottonseed Meal.
149—Inspection and Analyses of Commercial Feeding Stuffs.
150—Inspection and Analyses of Commercial Fertilizer.
151—Inspection and Analyses of Cottonseed Meal.
152—Inspection and Analyses of Commercial Feeding Stuffs.
153—Inspection and Analyses of Commercial Feeding Stuffs.
154—Inspection and Analyses of Commercial Feeding Stuffs.
155—Recent Cotton Experiments.
156—Inspection and Analyses of Cottonseed Meal.
157—Report of Work at the Delta Branch Station for 1911.
158—Report of Work at the McNeill Branch Station for 1907-1911.
159—Clearing Pine Lands.
160—The Cut-Over Lands of South Mississippi.

CIRCULARS.

Blackleg.
Boll Weevil.
Insect Pest Law.
Underground Waters of Mississippi.
Tuberculosis in Dairy Cattle.
Report of Work on Alfalfa at the Holly Springs Branch Station.

Address:

AGRICULTURAL EXPERIMENT STATION,

Agricultural College, Mississippi.

Mississippi Agricultural Experiment Station

BULLETIN NO. 162

Cotton Seed Meal as a Feed For Laying Hens

J. K. MORRISON

AGRICULTURAL COLLEGE, MISSISSIPPI

SEPTEMBER, 1913

TUCKER PRINTING HOUSE JACKSON MISS

INTRODUCTION

The hen is destined to play a very important part in the increase of farm revenue. She is at present poorly fed on the majority of farms. She needs better attention in order that she may produce her share of farm profits.

Marketing feed stuff through the dairy cow, the horse, the sheep, or the hog will not show as large margin of profit on feed as the hen. But to carry hens and get profit the feed must be grown on the farm.

To get the maximum returns the fowls must be fed with the same regularity as the dairy cows. It is not economical to give just enough feed for the maintenance of the body. By the utilization of waste materials around the barn the cost of up-keep is lowered, but far too many farmers allow the fowls to depend altogether upon their ability as foragers to make their own way. The average farm flock will not starve if left to pick up waste material around the barn where the stock are fed, but the hens will produce few eggs and what they do lay will come at the season when the prices are low. The random throwing of corn from the barn to the hens while the stock are being fed will not get good results either. They need a variety, which this method does not furnish.

Protein a Necessity.

It matters not how good the breed or strain of fowls you keep, if they are fed exclusively grain, they will not yield proper returns. The farm fowls of the South get throughout the winter, for the most part, corn, which will produce fat, but which, if fed alone, will not produce eggs.

We doubt if there are five per cent of the farmers in the State who make any attempt whatever to give their hens a well balanced ration. The balanced ration is certainly the underlying principle of profitable poultry raising.

Hens lay in the spring because they can find bugs and grass which balance the grain ration. In the winter nature lies dormant and the protein part of the ration must be supplied by the forethought and energy of man.

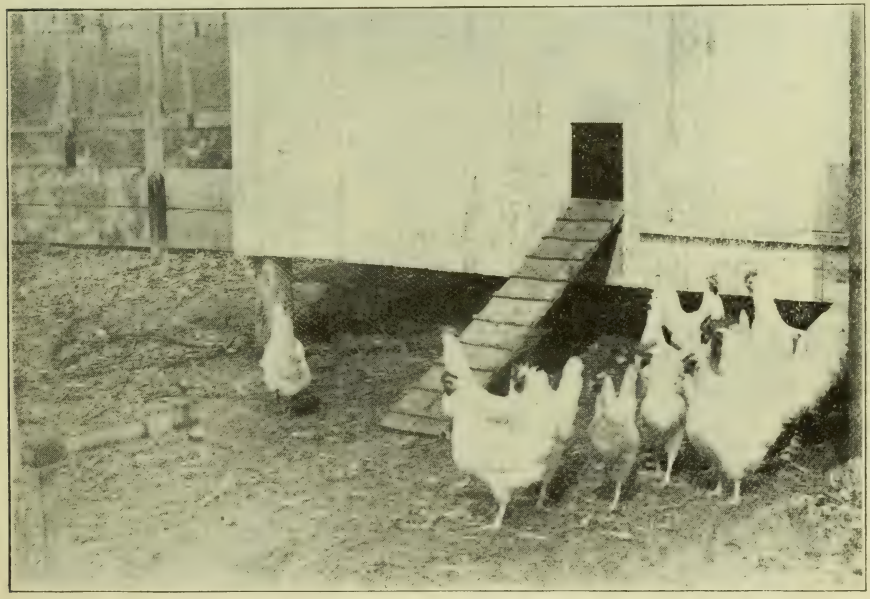
Cotton Seed Meal.

Beef scrap is a by-product of the northern packing house. All poultry journals and bulletins that the farmer reads advocate meat protein for the production of eggs. The Southern farmer knows little about beef scrap, and even if he should desire to use it, he would be compelled to order the product, as few of the merchants handle com-

mercial beef scrap. Cotton seed meal is something that he is acquainted with, and it is also available. Availability increases the prospect of its use many times.

In the work that we have conducted a comparison has been made in the animal protein and the vegetable. In the former test beef scrap was used to furnish the principal part of the protein, and in the latter cotton seed meal was the principal source. We have also compared the eggs as to fertility, the vitality of the little chicks, and the effect on the vitality of the hen.

This bulletin is a preliminary report. The work will be continued to get the cumulative results. We do not regard the report as final, as six months is insufficient time to determine fully the merits of cotton seed meal in egg production.



The Housing.

The open-front house has been used in the work. The six houses used front toward the north. They were built several years ago, when there was not the agitation for fresh air that there is today. At that time they used curtains, which were let down during cold weather.

They were not used in this test, but had the winter been very cold, there is no doubt but that the egg yield would have been influenced. The hens should be sheltered from the cold north winds by having the house to face the south.

DUCKS AND HENS ARE BEING COMPARED AS EGG PRODUCERS
A REPORT WILL BE GIVEN LATER

The Estimated Price of the Eggs.

The value of eggs is given at thirty cents a dozen. This is the price at which we have been selling eggs on a year-round contract. Eggs that are gathered fresh, graded, and sold to a market that will discriminate, should bring this price. Farmers cannot get this price as long as they follow the poor methods that are now used. These eggs were gathered regularly and reached the customer in first class condition.

The Varieties Used.

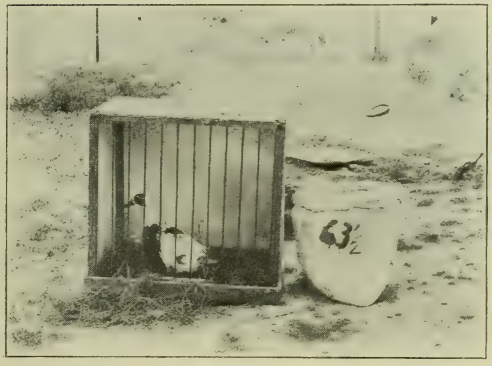
In Pens A and B, Rhode Island Red pullets of about the same age were used. Pen A was fed cotton seed meal mash, and Pen B was used as a check pen, being fed a mash that contained beef scrap as the principal protein element.

Pen K was made up of hens that were unfit for breeding purposes, as many were off color and of mixed breeds. In this pen I used the

maximum amount of cotton seed meal that could be fed with corn meal to maintain the ratio. I wished to see if this amount would affect vitality. It was not a fair comparison with Pen D, as this flock was made up of White Leghorn pullets of good breeding.

Pen E was composed of White Leghorns found on the plant, none of them less than two years old. In Pen F, used as the check pen, were Rhode Island Red hens that had laid one season. As two year old hens they laid well during the winter months, as not so much is expected from hens of that age during the winter.

The Droppings.



AN INDIAN DUCK RUNNER AND FEED EATEN IN SIX MONTHS

We made an effort to keep a record of the droppings, and from the various pens we got the following amounts: Pen A, 192 lbs.; Pen B, 148 lbs.; Pen K, 120 lbs.; Pen D, 120 lbs.; Pen E, 144 lbs.

Poultry manure is the most valuable to be had from the live stock of the farm. **The total amount was 864 pounds,** and is about as valuable as much of the fertilizer put on the market.

The analysis of the cotton seed meal and the beef scrap used in the experiment was as follows:

Beef Scrap.		Cotton Seed Meal.	
Moisture	6.25%	Moisture	7.17%
Ash	11.75%	Ash	6.46%
Fat	8.83%	Fat	6.37%
Protein	69.96%	Protein	32.50%
		Carbohydrates	33.38%
		Fibre	14.12%

The Rations.

PEN A:—
Corn meal 50 lbs.; wheat bran 10 lbs.; cotton seed meal 10 lbs.; oats 30 lb

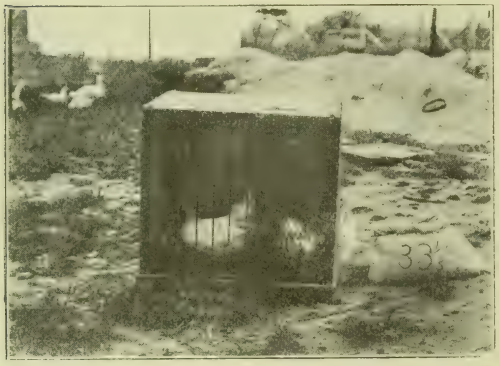
PEN B:—
Corn meal 50 lbs.; beef scrap 5 lbs.; oats 30 lbs.; wheat bran 10 lbs.

PEN K:—
Corn meal 73 lbs.; cotton seed meal 22 lbs.; wheat bran 5 lbs.

PEN D:—
Corn meal 73 lb.; beef scrap 11 lbs.; wheat bran 5 lbs.

Pen E :—
Corn meal 60 lb.; cotton seed meal 15 lbs.; wheat bran 5 lbs.; oats 20 lbs.

PEN F.—
Corn meal 60 lbs.; beef scrap 7½ lbs.; wheat bran 5 lbs.; oats 20 lbs.



A LEGHORN HEN AND FEED EATEN IN SIX MONTHS

All these rations were brought to the same nutritive ratio. The one most generally used is 1 to 4.5; that is, one part of protein to 4.5 parts of carbohydrates. This ratio is used in these rations.

The rations for Pens K and D are as simple as could be made to maintain a proper balance. The others contain greater variety, but the food value in the simpler ones was just as great as that of the rations containing the greatest variety.

Manner of Feeding.

The dry mash ration was fed in hoppers and kept before the hens all the time. The grain ration used throughout the winter was composed of equal amounts of oats, wheat screenings, and corn. The grain was fed in the straw with which the floor was covered and the hens were forced to scratch for it. The oats used in the mash were crushed at a mill used for grinding corn.

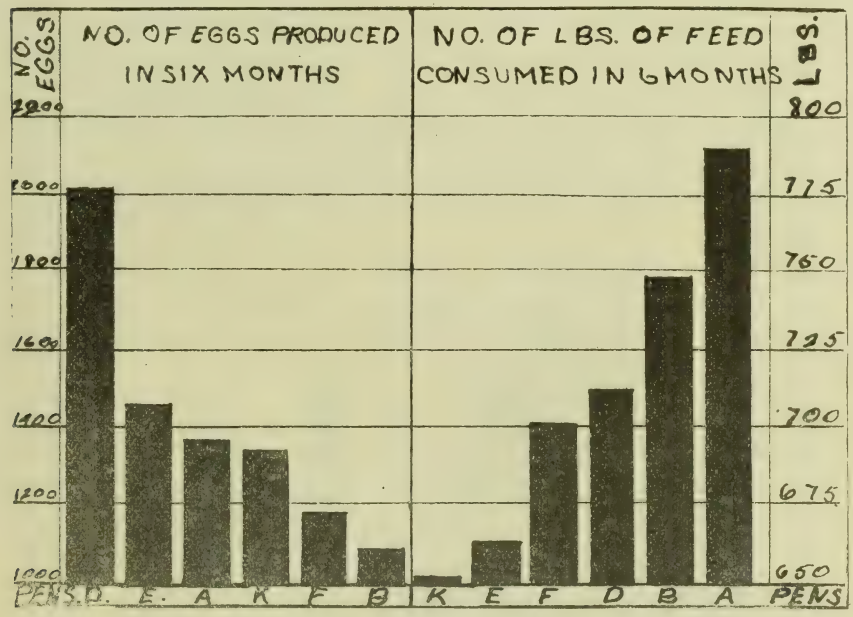
Grit, charcoal, and oyster shell were kept before them all the time, as these materials are essential for hens kept in confinement.

The yards were partitioned, oats were sown in them in the early spring, and as soon as the stand was large enough, the hens were allowed to graze on it. The green food during the winter was rape. A small patch was sown in the early part of the season, and this was thrown to them each day.

Egg Production by Months.

	Pen A.	Pen B.	Pen K.	Pen E.	Pen F.	Pen D.
January	233	172	222	162	162	303
February	221	226	259	174	174	344
March	238	188	242	284	284	385
April	266	208	254	311	311	388
May	236	183	208	313	313	347
June	173	110	157	214	214	256

Total pounds of feed consumed: Pen A, 785.2lbs.; Pen B, 748.1lbs.; Pen K, 652.75lbs.; Pen D, 712.5lbs.; Pen E, 663lbs.; Pen F, 701lbs.



The left-hand bars represent a comparison of egg production by pens. The right-hand bars represent a comparison of the amount of feed consumed.

It has been the general idea that chickens would not eat with relish a ration containing cotton seed meal. Pen A, in which was fed a cotton seed meal ration, consumed more than their check pen. Pen K did not eat so much as Pen D, but Pen D laid a good many more eggs, the production of which called for more feed. Pen K ate their feed well and never seemed off feed at any time. At the close of the test they

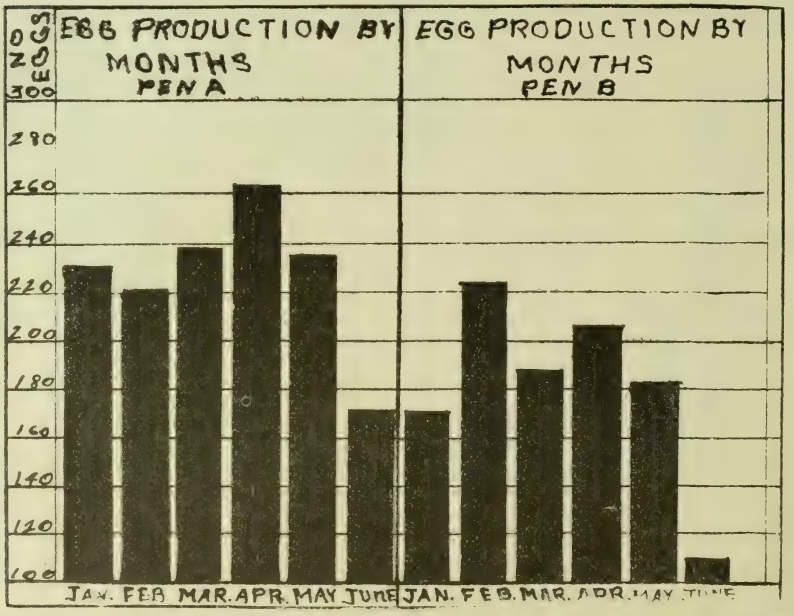
were in good health. Pen E did not eat as much feed as their check Pen F, but still they laid 274 more eggs than their check pen. They were Leghorns, which do not require as much feed as the heavier varieties.

The cotton seed meal used was brought to the proper balance by the addition of what is known as hull bran, manufactured by a Memphis firm. It was entirely free from linters, and this must be of some advantage. However, it is not always practical to order meal, as this would again bring in the question of availability.

The beef scrap contained about seventy per cent protein. This percentage is more than that usually found in beef scrap on the market, and twice the amount contained in the cotton seed meal.

Ration Pen A.
Corn Meal 50 lbs.
Wheat Bran 10 lbs.
Cotton Seed Meal 10 lbs.
Oats 30 lbs.

Ration Pen B.
Corn Meal 50 lbs.
Beef Scrap 5 lbs.
Oats 30 lbs.
Wheat Bran 10 lbs.



The bars represent a comparison of egg production for Pen A and Pen B for six months.

Weights of Fowls.

PEN A:—
Average weight at the beginning of Experiment 5 lbs., at close 4.62 lbs.
PEN B:—
Average weight at the beginning of Experiment 5.61 lbs., at close 4.85 lbs.

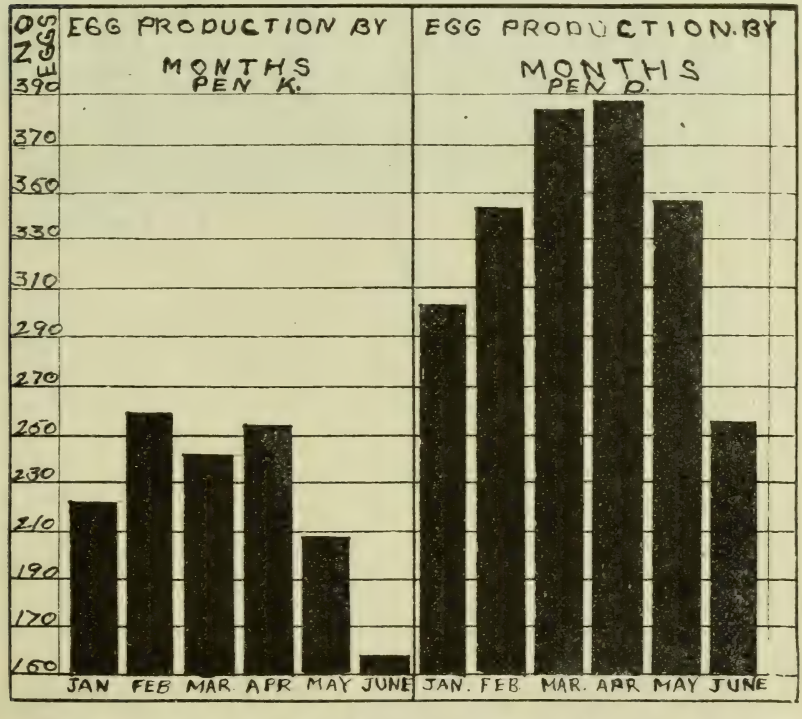
PEN K:—
Average weight at the beginning of Experiment 4.31 lbs., at close 3.62 lbs.
PEN D:—
Average weight at the beginning of Experiment 3.61 lbs., at close 3.15 lbs.
PEN E:—
Average weight at the beginning of Experiment 3.86 lbs., at close 3.50 lbs.
PEN F:—
Average weight at the beginning of Experiment 5.48 lbs., at close 4.46 lbs.

In comparing A and B, we see that the cotton seed meal pen lost less in weight than the check pen. In comparing Pens K and D, there is less loss in the beef scrap fed fowls. Pen F, fed a ration containing beef scrap, lost 1.08 lbs., while the check pen, E, lost .36 lbs.

Regardless of the fact that the fowls were allowed access to the dry mash all the time, the tendency was to lose flesh rather than gain. Pen D, which received sixty-seven pounds of corn meal to the hundred pounds of feed, was no exception to this rule.

Ration Pen K.
Corn Meal 73 lbs.
Cotton Seed Meal 22 lbs.
Wheat Bran 5 lbs.

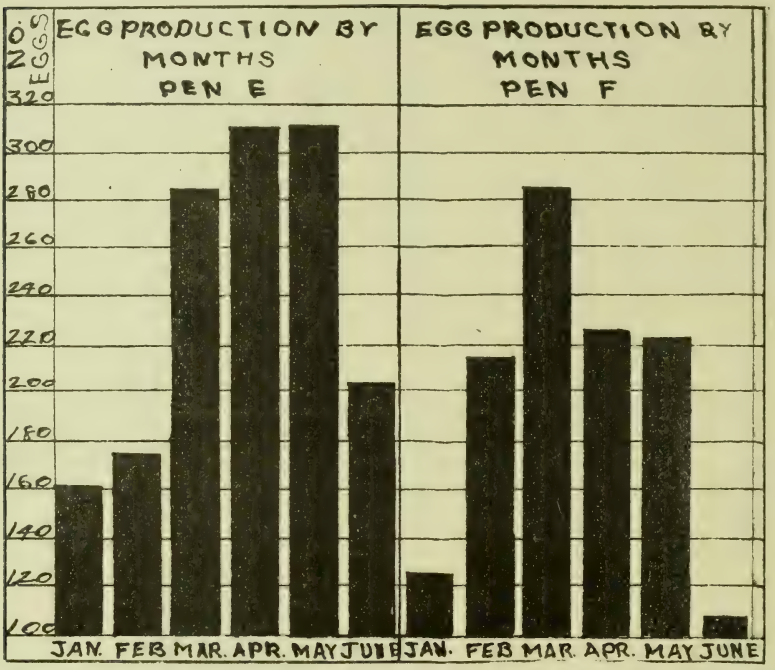
Pen D.
Corn Meal 73 lbs.
Beef Scrap 11 lbs.
Wheat Bran 5 lbs.



The bars represent a comparison of egg production for Pen K and for Pen D for six months.

Pen E.
Corn Meal 60 lbs.
Cotton Seed Meal 15 lbs.
Wheat Bran 5 lbs.
Oats 20 lbs.

Pen F.
Corn Meal 60 lbs.
Beef Scrap 7½ lbs.
Wheat Bran 5 lbs.
Oats 20 lbs.



The bars represent a comparison of egg production for Pen E and Pen F for six months.

Summary.

The experiment has tended to show:—

That cotton seed meal used as the chief source of protein is palatable to fowls, and that when fed judiciously on it they will produce eggs;

That hens fed on cotton seed meal will produce eggs when eggs are highest in price;

That as far as can be determined the general condition of the cotton seed meal fed fowls seems just as good as the condition of those fed on beef scrap;

That the tendency was to lose flesh and not get over-fat, although the fowls were allowed access to the feed at all times;

That there is a good margin of profit from hens when given a properly balanced ration.

We wish to call your attention to the fact this work is not complete, and results covering a much longer period will be given in order to get the cumulative effects.

Pen.	Corn Meal.	Wheat Bran.	C. S. Meal.	Beef Scrap.	Crushed Oats.	Corn.	Wheat Screenings	Whole Oats.	No. of Dozen.	Value.	Average Weight in Grams.	Cost per Dozen.	Cost of Feed.	Profit.
A	208.2	43.2	43.2	.....	128.6	151	151	60	114	$ 34.17	56.5	.1059c	$12.08	$22.09
B	206	87	.....	23.1	120	151	151	60	90 7-12	27.17½	60	.13+	11.84	15.33
K	212	15¼	63½	.....	.....	151	151	60	111 5-6	33.55	55.75	.088	9.89	23.66
D	296	10	.....	44.5	.....	151	151	60	168 7-12	50.57	54.25	.067+	12.05	38.12
E	176	12	44	.....	59	151	151	60	121½	36.45	56	.083+	10.09	26.36
F	220	18⅓	.....	27½ ×	73⅓	151	151	60	98⅔	29.60	60.25	.114	11.31	18.29

Total Profit.....$143.85

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

BULLETIN No. 163.

TRUCK CROPS FOR SOUTH MISSISSIPPI

By E. B. FERRIS

AGRICULTURAL COLLEGE, MISSISSIPPI

1913.

TUCKER PRINTING HOUSE JACKSON MISS

Truck Crops for South Mississippi

Introduction.—The growing of fruits and vegetables on the cut-over lands of South Mississippi should at some future time reach enormous proportions. The soils of this section of the state are naturally well suited to this class of farming, being sandy loams that drain well, dry out, and warm up very early in the spring, and, therefore, bring the crops grown on them to development much earlier than stiffer lands would do even under the same climatic conditions. However, this section of Mississippi is the most undeveloped portion of the state, with a citizenship composed largely, up to this time, of people who have followed other pursuits, such as lumbering and kindred industries, and who have taken up agriculture only since the timber has been so largely removed. It is not to be expected that people so trained should from the beginning be very successful in any branch of farming, particularly in such a specialized business as the growing of truck for northern markets.

The McNeill Experiment Station began active work in 1902 and for a number of years conducted a large number of experiments and demonstrations in growing truck crops on these cut-over lands and for as many years did everything within its power to encourage the people all over the section, where conditions would permit, to take up trucking in a small way and gradually work up to larger proportions. At that time a number of places organized truck growers' associations, and these were all united into a Truckers' League, which sent an agent to the principal trucking point, Cincinnati, to look after the interests of its members. But, as is usually the case with such organizations, all of these went to pieces, some of the places entirely stopped growing truck, and others grew and marketed their truck independently of any organization.

The people are again awakening to the possibilities of trucking, and the object of this bulletin is to put before them the results of experiments that have been made at McNeill, with a number of truck crops. We also desire to inform them that this Station has a great deal of information not only about the growing, but about the marketing, of truck crops, which information it stands ready to give them both in the form of printed matter and by means of personal talks to individuals and associations.

Our advice to communities expecting to begin this work is that each community should specialize on some particular truck crop to the exclusion of all others, expecially in the beginning. There are several reasons for this; namely, the people will the sooner be able to

have enough of some crop to justify buyers to come to them and purchase these crops at their station; a number of small growers can plant only a few acres each of any crop and still be able to ship by freight in car lots; and also they will establish a reputation for some one crop much quicker than they can for a large number.

The people of our community have grown very largely snap beans in the spring and sweet potatoes in the summer and fall, the two crops maturing well on the same land in a single season. In this way the neighboring towns of McNeill and Carriere have developed to the point where these two crops bring in more ready money to the farmers than all their other crops combined. In these communities nearly every small farmer plants one or more acres of beans and sweet potatoes and depends very largely on them as money crops.

A great many people have been led to expect too much from truck crops. Before going into such work it would be well to realize that average returns from any crop will fall far short of the profits about which we read. It is the exceptional result that we usually read about and frequently hear discussed by lecturers. Such things are pleasing to hear and attract attentive audiences, but farmers or truckers who go into this work expecting such results will nearly always fail, for they are bound to feel they have fallen far short of what they believe others might have done. From an acre of sweet potatoes grown at the McNeill Station the writer has shipped for two years in succession more than 240 bushels of potatoes; but in larger acreages during the same years, the yields have averaged no more than one hundred bushels per acre. The big returns about which we read are often the result of extraordinarily favorable conditions, and at best are only to be attained on soils much more highly developed than the average soil of South Mississippi.

There are several things that go to determine whether or not a given community may reasonably be expected to engage in truck growing successfully. These may be considered under the heads of soils, climatic conditions, transportation facilities, labor, and fertilizers. The first consideration is the soil, for before beginning work of this nature we must remember that there is a vast territory on all sides of us in this extensive country of ours with which we must come into competition, and that we would be inviting disaster to begin such work on soils naturally unsuited to it. In general, sandy loam soils that drain well and dry out and warm up early in the spring are best adapted to growing truck crops, not that they will make as large yields as heavier lands might do, but that they will bring perhaps smaller yields to maturity from a few days to a few weeks earlier than the stiffer

lands would do, earliness in maturity frequently making the difference between success and failure in a truck crop. The cut-over lands have ideal soils physically for such crops, but in their natural state before being built up and fertilized, they will no more produce profitably than would the Desert of Sahara. The rainfall of this section is very heavy and is divided into four seasons, of which the spring and fall months are usually dry and the winter and summer months are practically always very wet. The temperature of the section is fairly equable, much more so than that of the state as a whole. The winters are mild enough to grow all the hardier vegetables, such as beets, cabbage, onions, etc., out of doors, and the summers are not so hot but that these same crops may be sown in the open field in summer and be left in place to grow and develop in the fall and winter.

The success of a trucking community is entirely dependent on its facilities for getting produce promptly on the markets to the north of it. This means that unless it is on a railroad having quick and direct access to the large markets of the country, it cannot possibly compete with other places of equal natural advantages that are so situated. As a rule, railroads that run north and south, or nearly so, have a decided advantage over roads that run east and west for any considerable part of the way; because for every disadvantage the north-and-south line has in being fourteen miles away from a given market, it has a corresponding advantage in having its crops mature one day earlier in the season, while the east-and-west line has not this compensating advantage. It is also very important that the railroad serving a trucking community should run into the large cities independent of any other line so that express shipments will not have to break bulk and there will be no delays due to missing connections. Some railroads, too, specialize in the handling of perishable products, and such are always to be preferred to other lines which may have equally good facilities but which lack the organization necessary to handle perishable freight. Of all the Southern roads the Illinois Central apparently offers the best facilities for handling truck crops, and it is to be noted that the best trucking communities in Mississippi and Louisiana are located on this road. However, there are several other railroads in Mississippi that could with a little effort serve a very large part of the cut-over lands as distributers of truck crops.

The element of labor enters more largely into growing truck crops successfully than it does into any other branch of farming. Not only must the owner of the farm be a man of intelligence and judgment, but he is compelled to obtain a great deal of labor at certain seasons

when his crops are being marketed. If the trucking operations of any man or community are extensive enough, this additional labor for the gathering period may usually be had in nearby towns or cities and can be temporarily taken care of in tents, if houses are not available. In many of the trucking communities elsewhere a transient body of labor will frequently follow up the crops as they are ready for market, beginning at the south and following the crops as they come in farther north. No other kind of crop production requires a more intelligent or skillful class of labor or a keener insight into the field of production and distribution on the part of the owner or manager. To expect absolute success from the beginning from people who have had no previous experience in such work is almost out of the question, yet this should not deter new communities from going carefully into such work with the advice and assistance of some one who has had experience. A great deal of the labor required in growing truck crops can be done by women and children, and in communitites where large families are the rule, such as is generally the case with us, we may expect enough surplus help to handle several acres of truck crops to the family, and the aggregate of many families might easily build up a large trucking community with no outside help necessary.

A good soil is an important consideration in any branch of farming; in fact, it is the most important thing of all, and it is doubly important in trucking. Not only should a trucking soil have plenty of plant food in it, but such food should be readily available and easily taken up by the plant roots. The quality, as well as the quantity, of a truck crop is affected by the richness of the soil, and no man ever grew good crisp vegetables on land where development was retarded by the lack of available plant food. Commercial fertilizers must be used in liberal quantity, but in no case must we expect them to take the place of humus and organic matter. There is no fertilizer that will equal animal manures in building up a good truck soil, and the writer knows of no way of obtaining these manures so cheaply or so satisfactorily as by the keeping of a few dairy cattle. In fact, dairying and trucking should be companion occupations, as they fit in together in many ways and work out to the good of the farmer. Dairy cattle will not only furnish the manure to enrich the lands on which to grow the truck, but they will furnish a market for a part of all crops that will not pay the expense of crating and freighting. They will also provide a market for the numerous leguminous crops so necessary in keeping up the humus in the soil and in supplying the high priced nitrogen that truck crops must have in large quantities. It is this increased quantity of nitrogen in vegetable fertilizers that makes

them cost the farmer so much more per ton than do the average cotton and corn fertilizers. The shipping facilities that will enable one to market truck crops successfully will also enable him to market his dairy products as sweet milk or cream, and at a price twice as great as he could get for the same products made into butter. The same degree of intelligence and skill will be necessary with the dairyman as with the trucker, and on the whole we feel safe in saying that no two occupations ever fitted so well together. The manure from any kind of live stock will, however, do practically as well as that from dairy cattle, if produced from the same class of feeds. This station has had good results from buying the manure from livery and sales stables in New Orleans and having it shipped out in cars. The cost of handling such manure and of hauling to the farm prevents the paying of any considerable price for it in the city.

This station has conducted hundreds of tests with fertilizers under all classes of truck crops, and the following sums up our opinion as to the need of the average truck crop grown on these soils: such crops require rather high percentages of nitrogen and this should be furnished in part by nitrate of soda, which is immediately available, and in part by some nitrogen carrier like cottonseed meal or sulphate of ammonia, not so readily available, which will feed the plants after the nitrate of soda has been used up. With the truck crops occupying land a considerable time, such as cabbage or Irish potatoes, it is usually best to apply the nitrate of soda as a top dressing to the growing crop. On all the soils of the long-leaf pine belt liberal applications of phosphorus should be applied, and in nearly all instances we recommend acid phosphate as the source of this phosphorus. Such applications of acid phosphate may be made some time in advance of planting, as there is little danger of its leaching out of the soil if there is a fair amount of clay in the subsoil. If the land is rolling, however, there is danger of its washing off over the surface. The majority of experiments conducted at the McNeill Station have not shown the need of potash under truck crops and we do not advise its general use. We will say, however, that this is contrary to the teaching of most agriculturists, and we suggest that each individual grower satisfy himself as to the need of potash on his soils by conducting simple field tests with fertilizers with and without potash in them. At this station we have usually obtained good results by applying to the grosser feeding truck crops, like cabbage, turnips, beets, Irish potatoes, asparagus and onions, a mixture of 500 pounds of acid phosphate and 250 pounds of cottonseed meal before planting or setting, using about one hundred pounds of nitrate of soda as a top dressing.

later. For plants like snap beans, tomatoes, and sweet potatoes, one-half these quantities is sufficient, to be applied in much the same way.

Insect pests and fungous diseases are very bad in this section, and there has been no crop tried here that has been entirely free from some trouble of this kind. Our mild winters and extremely wet summers are very favorable to both, and the most difficult part of the whole problem is that frequent rains make spraying against these pests very unreliable. San Jose scale is pretty well distributed throughout the section, and two years' experience here in spraying against this trouble convinces us that it is impossible to kill it out entirely and that to grow fruit will require annual spraying. The curculio is also very destructive here, and if not successfully combatted it will frequently ruin every peach or plum in an entire orchard. Also, the peach tree borer is likely to ruin the peach and plum trees unless constantly fought, and even then it will do serious damage. On the whole, experience at the McNeill Station has been rather discouraging to the growing of tree fruits with the exception of figs, oranges, pecans, and certain varieties of pears. Grapes have done only fairly well, but may be made to succeed with moderate spraying with Bordeaux mixture to keep down black rot and other fungous diseases. The scuppernong does remarkably well and has shown no pronounced tendency to trouble of any kind. We have had serious trouble here with nematodes on the roots of both fruits and vegetables, and we have never been able to do anything to control it further than to change the crop.

Apples.—Soon after it was established this station set out an experimental orchard for testing varieties of apples, pears, peaches, and plums. While the apple trees lived for several years and bore some fruit, not a variety promised to be worth any thing, and the trees, having become infested with scale, were finally destroyed. Evidently we are too far south for the apple to thrive. These apple trees grew very slowly and always appeared stunted, while peach trees grown on the same character of soil and just a few steps away made a remarkably good growth.

Peaches.—Some thirty odd varieties of peach trees were set out on the station farm, and in addition to these, one hundred trees were used to test the fertilizer requirements of the crop. We have never seen trees grow more rapidly or have a healthier appearance than these peach trees for the first three years. They appeared to be doing so well that an additional orchard of one thousand peach trees was started. About this time San Jose scale appeared in a neighbor's orchard two

miles away and within a year appeared in ours. The trees were sprayed thoroughly for two winters, but frequent rains made it very unsatisfactory. Even tho we tried to spray when the weather appeared to be favorable, it would nearly always rain within twenty-four hours and largely wash the mixture off. A number of these trees were killed outright by scale and nematodes, together with what appeared to be crown gall. These troubles, along with borers, so weakened the trees that fully half of them died outright, and the rest were pulled up and burned. General experience of others in this section is that peach trees grow off rapidly, do well for a few years, and then gradually die down. The writer has seen a few seedling orchards that have attained considerable age, but the fruit from such orchards could be used only for home consumption and not as a market crop.

Plums.—Almost the same work done with peaches was carried on with plums with practically the same results. In addition to the troubles of the peach, the plums were badly damaged by the curculio. A variety orchard of some fifty plum trees and a commercial orchard of five hundred trees had to be destroyed after a large percentage of them had died. In isolated cases the writer has seen some very fine plum trees in this community which have born perfect fruit of the best quality.

Pears.—Certain varieties of pears do fairly well here, and the fruit seems to have fewer enemies than peaches and plums. Blight is a serious trouble, but is apparently no worse than in other sections of the state. A number of small pear orchards are to be found here that have attained considerable age, and even with the neglect that they usually receive, have continued to live and bear fairly good fruit.

Figs.—This section is the natural home of the fig. The crop generally does remarkably well when grown under back-yard conditions, but very poorly when cultivated in orchards. This is evidently due to some insect or disease affecting the roots of the fig which thrives when the ground is kept soft around the trees, but which is retarded by the packed conditions of the soil in yards or similar places. In thickly settled communities there is no reason why the fig crop should not be made to pay handsomely in this section for canning purposes, but the fruit is rather too perishable to be shipped for any considerable distance. Along the coast a good many figs are canned and the price paid for the fruit ought to make the production of it profitable.

Grapes.—Several varieties of grapes are now being grown at the station and have done fairly well. We believe that in the hands of experienced growers this crop can be produced successfully, but, as in other parts of the country and state, it will be necessary to spray.

A fairly good quality of this fruit has been grown here this year without spraying, but such fruit would hardly sell on the markets in competition with grapes of other sections. Scuppernongs grow here perfectly and require no spraying, but we have found that pruning is quite as helpful to them as to other grapes.

Pecans.—Several varieties of pecan trees were set out at this station in December, 1902, and while a number of them have died, there are now growing several very fine trees that have made an immense growth. The trees planted were budded and of good size to begin with. The best of these trees bore a few nuts in 1911 but not enough to be of any commercial value. None of the trees bore at all in 1912, nor have we been able to find any fruit on these trees up to the first of August, 1913. These trees were planted on a plat of ground that seven years later had to be used as a pasture for cattle, and the trees were scarred up somewhat by the cattle, but not enough to injure the growth apparently. If the time required for these trees to begin profitable bearing is indicative of what is to be expected from commercial orchards, the benefits to be expected from a pecan orchard here, even though good in the end, will partake of the nature of a life insurance policy. A seedling pecan orchard owned by a neighbor of ours was large enough ten years ago to prevent the cultivation of the land on which the trees were growing, and while this orchard has produced some fruit every year since that time, there has never been enough to pay interest on the investment. This experience and observation make us hesitate to recommend pecans to persons compelled to have an income on their investments for current needs, but even the poorest man should have some pecan trees around his premises to serve as shade, with the final hope of their being a producer of revenue. No tree makes a better or prettier shade, and they grow here to perfection.

Mulberries.—While the mulberry has no market value and could hardly be classed as a truck crop, it grows here remarkably well and continues to bear throughout the months of spring and early summer, furnishing an appetizing fruit for the family and a good supplementary feed for chickens and hogs. The trees, too, furnish a good shade and have no serious insect enemies that we have observed, a thing in itself remarkable.

Strawberries.—We regard the strawberry as the most reliable of all the small fruits for this section, and experience at this station in growing them for several years has been, on the whole, quite satisfactory. In fact, some of the best berry sections of the entire South are on lands similar to ours, in the country along the Illinois Central

railroad, in the Florida parishes of Louisiana. In that section the strawberry crop alone brings in annually more than one million dollars and is produced very largely by Italians. So far as we are able to judge the lands of this section should grow as good berries as the Louisiana lands, if not better, for the reason that our land is better drained. The picking of a berry crop requires a great deal of labor that should be trained for the work, for success depends largely on the picking and packing of the fruit. Suitable labor has been the most serious obstacle to growing the crop at this station, and the difference between the berries picked from the same rows by good pickers and bad pickers has frequently been greater than one would think. In fact, we know of no crop the success of which depends so largely on labor as does the strawberry, and for this reason our population will have to change materially before it becomes a popular crop with us.

This station has conducted a large number of experiments with fertilizers under strawberries, and with varieties as well, and has given results from time to time in its annual reports. The strawberry does not require a very rich soil, as compared with other truck crops, and it should by all means be grown on land free from such grasses as bermuda, coco, and crab grass. The plants are hard to clean at best, and for some time during the picking season they cannot be cultivated at all on account of the danger of ruining the fruit with sand or grit. If such grasses are plentiful the cultivation of the plants will be both expensive and damaging to the stand. An ideal preparatory treatment for land in this section on which strawberries are to be grown is to plant on it the season before a crop of cowpeas or velvet beans, which would shade out crab grass and leave the land free of the seed. Even freshly cleared lands here have been used with marked success, depending on commercial fertilizers entirely to furnish the plant food required. Old fields that have been lying out for several years and have come up to lespedeza are ideal places in which to plant strawberries.

The method of preparation and planting as pursued at this station is about as follows: Thoroughly break and harrow the land some time in advance of setting out the plants; lay off into rows about three and one-half feet apart and two-furrow these with turn plow; place on top of this list one-half the annual application of commercial fertilizer; mix this thoroughly with the soil by running over it with a top harrow of some kind; complete the beds with two or more furrows from turn plow and knock down with harrow or implement of some kind to where the beds are only slightly higher than the average of the field. The land is then ready for the plants, which may be set

any time during fall or winter. Plants shipped from a distance will have to go into winter quarters before it will be safe to ship them, on account of their heating badly while still sappy. Plants that do not have to be closely packed may be moved much earlier, and when plentiful, may even be set out in summer and be expected to bear the following spring. Ordinarily a crop of berries cannot be expected the spring following planting. When the picking season is over in the spring, the rows are barred off so as to leave only enough plants to grow through the summer and make new plants for the succeeding year's crop. The plants are then fertilized with one-half the annual application and the middles thrown out after hoeing. After this they are cultivated pretty much as you would cotton and allowed to make new plants. In the fall, if the plants have done well, there will be many more on the land than will be best to leave, and these should be taken for planting additional land or for marketing. The method described is known as the matted-row system and is the only one we have tried here.

Experience at this station has been that raw ground bone is one of the best fertilizers for berries. This furnishes nitrogen and phosphorus in about the proper proportions, and being slowly available, comes into solution gradually and feeds the plants as they need it. The following table gives results of several years' work here with fertilizers under berries. This work was carefully done and daily pickings of berries measured for weeks during each picking season:

Plat.	Pounds per Acre.				Yield of Berries in Quarts per Acre.		
	Cotton Seed Meal	Acid Phosphate	Kainit	Lime.	1904	1905	1906
1	210	228	96	0	3980	2620	2440
2	210	228	96	200	4000	3100	2415
3	105	246	52	0	3840	2380	1950
4	210	492	96	0	4600	2990	2490
5	210	228	0	0	3930	2240	2520
6	210	0	96	0	3550	1840	2375

Berries have been grown here for four years in succession on the same land, and have been marketed largely in the towns along the New Orleans and North Eastern railroad at prices quite remunerative. A few shipments to Birmingham, Chattanooga, and Cincinnati were marketed profitably, but having been grown in less than car lots, shipments so far away are likely to reach the markets in bad condition. Unless berries can be grown in quantities sufficient to ship in car lots under refrigeration, we cannot recommend them as a money crop except under such conditions as confronted us here when the station

was first established. At that time local growers around the nearby towns had not begun to supply their home markets.

Oranges.—In January, 1908, four varieties of citranges were sent here by the U. S. Department of Agriculture to be tested. They have made a fairly good growth, but have never borne any fruit of any consequence and have only a few oranges on them this year. In the fall of 1911, some two hundred and fifty orange trees were put out, including seven different varieties and a large number of satsumas. These trees are growing well, and some of the better grown ones among them have set some fruit this year. Already we note serious trouble with sooty fungus, especially on the citrange trees, which indicates that to grow the fruit successfully they must be sprayed. The writer has seen some as nice oranges as were ever shipped to McNeill growing on trees in this community, and the fruit should be generally grown for home use if not for market. The winters here are seldom cold enough to kill the trees, and such a degree of cold has not occurred here since the station was established. Even if the temperature should go low enough to kill the trees, they can be banked in winter so as to protect the lower part of the trunk, from which new growth would spring and soon replace the part killed.

Other Small Fruits.—Dewberries, blackberries, and raspberries have been grown at this station in a small way. The first two grow wild in great quantities, and we see no reason why they should not prove important market crops; but varieties suitable to the section would have to be selected, as the kinds we tried did not do so well as native kinds. We had almost no success with raspberries. Doubtless in the hands of a good plant breeder native blackberries and dewberries could be developed and improved to the point of being important market crops for this country. Dewberry culture in some sections of North Carolina ranks with strawberry culture.

Asparagus.—If it were not for the fact that several years are required to get money returns from an asparagus crop, it is one that should appeal to the small truckers of this section. It grows fairly well, and requires little attention except during the shipping season. Being light and relatively high priced, it is almost always shipped by express, so that any quantity may be grown and marketed in competition with more favorably situated places. It is a crop that requires a rich soil to begin with and expensive fertilization every year. In our long growing season the crowns will grow large enough in a single season for planting in the permanent rows. At this station we have grown these crowns from the seed with pronounced success. A single year's growth in this section will develop crowns fully as large as the

two-year-old crowns of the north. Land on which asparagus is grown should be prepared very deeply so that the crowns may set sufficiently under the ground to prevent their growing to the surface in a few years, as they will do if planted shallow. At this place the permanent rows have been put about four and one-half feet apart and have been opened with several furrows from a large turn plow followed by a middle burster. Even after these operations it is well to follow with shovels and get out the loose dirt. The fertilizer used should be placed in the bottom of this furrow, and with the plow mixed well with the soil. The crowns are then placed in the bottom of the furrows from twelve to fifteen inches apart, properly spread out and covered with turn plows. This should be done in the fall, and the succeeding year's growth will usually develop the crowns to the point where they will be strong enough to produce marketable grass the succeeding spring. During the shipping season these stems must be cut every day, and tied into bundles. The bundles are placed twenty in a case and shipped to the market, where it usually brings fancy prices for several weeks. Nearly all the asparagus grown at this station has been shipped to Chicago, at which point it brings as good prices as asparagus from any other place in the south. In the winter of each year, just before the crowns begin to send out shoots, the rows are barred off and given an application of fertilizer.

Tests with fertilizers under this crop have been carried on at McNeill for years, and the following table gives the results of this work:

Plat.	Fertilizer—Pounds per Acre.				Yield of Asparagus per Acre.						
	Cotton-seed Meal	Nitrate of Soda	Acid Phosphate	Kainit.	1905	1906	1907	1908	1909	1910	1912
1	256	128	400	160	1168	1396	840	1608	1312	963	1577
2	256	128	200	160	892	1128	876	1684	1356	1032	1272
3	128	64	480	104	932	1132	844	1700	1304	1180	1400
4	256	128	400	0	892	1076	828	1552	1224	1048	1289
5	512	256	800	336	952	1312	920	1780	1284	1224	1784
6	0	0	0	0	760	952	712	1348	852	576	788

The above tests were conducted on six plats of land of one-sixteenth acre each, which, in January, 1904, had been broken and subsoiled to a depth of eighteen inches, and laid off into plats one foot apart. There were two rows to the plat and these were opened to a depth of eight inches, fertilized, and Palmetto asparagus crowns, grown from seed planted here the fall before, were placed fifteen inches apart in the drill. When planted this asparagus was fertilized with

cotton seed and cottonseed meal, but the next year this was changed so as to give the same amount of nitrogen in the form of cottonseed meal and nitrate of soda. Evidently the blank plat above, No. 6, got some fertilizer from the other plats, for it is not possible that asparagus planted here in a field to itself and never fertilized would make any thing at all. As a matter of fact the quality of the crop grown on this blank plat was very poor and so stringy as to be worth very little. During the last few years asparagus rust was very bad on this crop, and this, together with the crowns coming too close to the surface, caused us to plow up the patch the present year.

Beans.—Perhaps the least expensive and the most easily grown of all truck crops is the snap bean. It does well on soils of medium fertility and does not require heavy applications of fertilizers, though it responds as readily as most other crops to good soils. This crop occupies the land only about seventy-five days from the time of planting, and since about the first of March is the average date of planting in this section, it can be grown and marketed in plenty of time to grow afterwards first-class crops of potatoes, corn, cowpeas, and other field crops. The seed are rather inexpensive, and no great skill is required to grow and market the crop. This station has done a lot of experimental work with beans and has also grown the crop for demonstration. A special pamphlet has been issued on the subject as Bulletin No. 131, which can be had for the asking. While by no means a complete treatise on the subject, it is complete enough to meet the requirements of the average trucker.

Beets.—Beets sown in this section in the fall and allowed to grow in the open field in fall and winter have proven a fairly reliable truck crop. On October 10th, 1906, one-third of an acre of land of medium fertility was planted to Egyptian Blood Turnip Beet seeds in rows three feet apart. The weather being dry, the ground was thoroughly rolled to induce germination. About half of these seed came up promptly, but the other half lay dormant in the soil and did not germinate until six weeks later, after a rain had fallen. Old and young plants grew off well, though the difference in age caused the marketing period to be unduly extended. The cold weather interfered little with these beets, and we began shipping on January 15, realizing from the one-third acre, $70.76, after paying express and commission. The beet requires a rich soil, and like most other truck crops, it does not pay to grow them except on good land.

Cabbage.—The cabbage is one of the staple truck crops grown almost universally in trucking communities, besides occupying a prominent place in all the home gardens. It is an extremely old vegetable,

with an origin possibly in southern Europe, where it is found growing now in a wild state. So much has been written about the cabbage that the writer can hope to add little to the sum total of knowledge concerning it, but hopes here to condense the essential facts about its growth into convenient form for the benefit of any one who may grow the crop in South Mississippi. The information here given is derived from various sources, but is based largely on results with this crop at the McNeill Experiment Station during the past eleven years.

The cabbage is quite a hardy plant, but is a gross feeder. It will stand abuse if in the end it finds an abundance of plant food and a damp cool climate in which to develop. The crop will not stand very much hot dry weather, and whether grown as a winter or spring vegetable, it should be developed chiefly in the cool months of the year. It will stand a great deal of cold, especially when the plants are of good size and have been gradually hardened to it. A very slight freeze will kill hot-bed cabbage, but a temperature of twelve to thirteen degrees below freezing has not injured the crop in this section when the plants have been developed in the open field.

The McNeill Experiment Station has grown cabbage every year since it was established in 1902, frequently raising both a winter and an early spring crop, and has conducted a number of tests with them largely to determine the fertilizer best suited to the crop. Like all truck crops, it has failed at times to be profitable. There are years when, after the crop is made, it will fail to pay the cost of cutting and shipping, and when, unless there is livestock on the place to consume it, the crop will prove an expense to get off the land. Such an undesirable conclusion is much more apt to happen here with the spring than with the winter crop. In addition to the bad effects of the hot spring days on the growth of the crop, droughts are then more prevalent and insect pests much more active.

The method usually followed in propagating cabbage is to plant the seed in hot bed or cold frame some weeks in advance of the time the plants are to be set in the field. For the spring crop this is done to protect the tender plants against cold, and for the winter crop, to protect them from the scorching rays of the sun. Our most successful crops of fall and winter cabbage have been made by planting the seed directly in the field where they are to grow, afterwards thinning the plants to a stand just as you would cotton or corn, and using the surplus plants if necessary to set out additional land or to sell if a market can be found. In this way the crop is not set back by transplanting, and the laborious task of setting them out is at least partially avoided. Cabbage seed planted in cold frame, or in some spot that may be

shaded, in late August will be ready for transplanting in early October, or, if planted in hot bed or cold frame in November, it should be ready for transplanting early in January. In the mild winters of this section cabbage plants may be developed in the open field at a very small cost, and we see no reason why we might not compete successfully with the coast country of South Carolina in growing frost proof cabbage plants for market. In fact, we have grown such plants here for several years, but have sold them only in the local market.

The cabbage and its closely related species, such as cauliflower, collards, kale, kohlrabi, rape, and turnips,—all of which are successfully grown here,—require very rich soils, and while commercial fertilizers must be used under them, we should not make the mistake of depending entirely on purchasing in a sack the plant food they require. Humus is more important in crops of this class than it is with most others, and it cannot be economically added to a soil with commercial fertilizers. Land on which such crops are to be grown should preferably first be built up with heavy applications of animal manures, obtained either by penning cattle on the land or by hauling the manure to the field. In addition to this, frequent crops of cowpeas or velvet beans should be grown on the land and turned into the soil to supply additional humus. The quickest way by which we have ever been able to build up these soils is to grow a crop of corn and velvet beans, gather the corn, graze off the beans after frost with dairy cattle, turn under the litter and droppings from these cattle, and then on the succeeding crop use a fertilizer rich in phosphorus. In this way land which had a productive capacity of only twenty bushels of corn per acre was built up in one year to produce more than sixty bushels per acre. Besides, the grazing off of the beans was worth eight dollars an acre to the cattle. A number of tests have been made at this station, to determine the fertilizer requirements of cabbage, and as good results as we ever had were got from a mixture of 500 lbs. of acid phosphate and 250 lbs. of cotton seed meal applied just before the cabbage were planted, and supplemented by about 150 lbs. of nitrate of soda, given in two applications during the growing season and worked into the soil as the cabbage were being hoed or cultivated.

As a concrete illustration of what may be expected in this station from a crop of winter cabbage we give the results of one year's experience in growing the crop as reported in bulletin No. 158 of this station.

In 1909, land where strawberries had grown in the spring and early summer was well prepared when the berries were plowed up, and kept in good tilth for several weeks in advance of planting the cabbage. On August 25th this land was laid off into three-foot rows.

These were two-furrowed, and a mixture of acid phosphate and cottonseed meal applied on top of this list and harrowed in with an orchard harrow. The beds were then completed by throwing out the middles with a turn plow and immediately harrowing down until the heads were only slightly higher than the average of the field. These rows were then opened with a garden plow, and Charleston Wakefield cabbage seed were sown by hand on August 27th and covered by hand with garden rakes. The field was then rolled with a two-horse land roller, and this was followed by a weeder to leave a light dust mulch. One and one-quarter acres were sown in this way and the seed soon came up to a perfect stand. On October 8th these cabbage were thinned out to a stand, and the surplus plants were used to set out additional land. There were enough of them to plant an additional one and three-quarter acres. The land on which the plants were set was not nearly so well improved as was the land planted in seed, and produced considerably less than half the total yield of the entire patch. We began cutting these cabbage on December 9th and continued to cut them up to March 11th. From the three acres there were sold 294 standard crates for shippers, yielding net returns of about $340.00. A good many of the poorer stalks and the lower leaves and stalks from the heads that were shipped were hauled out from time to time and fed to dairy cattle, perceptibly increasing the milk flow. The winter of 1909-10 was as cold as the average winter in this section, the thermometer going below freezing a number of times and as low as 20 degrees during the latter part of December, yet not one of these cabbages was killed by the cold. Considerable quantities of winter cabbage have been grown at this station several times since this experiment. We found top dressings of nitrate of soda very helpful to all these cabbage.

On the whole, we believe the winter crop of cabbage is more reliable in this section than the spring crop. It requires less work, insect pests are not so bad, droughts are not so damaging, and we believe the markets for them are more reliable. A good many winter cabbage may be marketed in the towns of our own state at better average prices than the cities of the North will pay. The cabbage worms are very destructive to spring cabbage, and they will sometimes get pretty bad on the fall crop before cold weather begins, but usually they disappear when winter sets in. These insects can be controlled by dusting a mixture of one part Paris green to sixteen parts of flour over the cabbage while the dew is on. After the crop begins to head use a mixture of about two parts flour and one part powdered white hellebore. However, they are difficult insects to

combat successfully, as they work between the leaves of the cabbage in such a way that poisons cannot reach them. The Harlequin cabbage bug sometimes becomes very bad in this section on the spring crop. While there are a number of ways that are recommended to combat him, we have never been able to fight him very successfully except by hand picking, and this is very costly. Remedies for controlling all the insect pests and fungous diseases that are destructive to crops in this section may be had from special bulletins dealing with these subjects, written by practical men who have studied the problem here with us. These bulletins may be had from the Mississippi Experiment Station for the asking, and should by all means be in the hands of all persons who attempt to grow truck in southern Mississippi.

Irish Potato.—The potato is closely related to several poisonous plants, such as henbane and belladonna, as well as to such edible plants as the tomato and egg plant. At certain stages of its growth, notably when exposed to the direct rays of the sun and allowed to green over, it develops a poisonous substance that may be used to kill vermin. The potato is of American origin, having been introduced first into England and then into Ireland some time after the discovery of the New World. In Ireland, it became so necessary a food product that it soon took the name of Irish potato, by which it is almost entirely known to us. The potato is propagated altogether from cuttings of the tuber, but many new varieties have been originated from the seed, which, however, will by no means reproduce the parent plant with any degree of certainty. It is more universally grown than any other vegetable or food crop, and we seldom find a farm or homestead that does not produce potatoes in a small way at least. The potato adapts itself to a wide range of soil conditions, the best potato soils being sandy or clay loams, always with clay subsoils. The sand loam soils, such as the ones of this section, while frequently less productive than heavier lands, are more conducive to early development, and therefore to growing this crop for early markets.

The potato is a deep feeding plant and naturally the land on which it is grown should be plowed deep, four inches being about the depth at which the seed potatoes should be planted. This does not necessarily mean that the land should be subsoiled. On the contrary results at this station indicate that it does not pay to subsoil these lands even for the potato. But the soil should be plowed as deep as it will stand with an implement that pulverizes it thoroughly. At the same time some kind of organic matter should be turned under to decay and form humus. In this section we do not believe a better preparatory treatment of the soil for potatoes could be given than to

plant a crop of velvet beans, graze it off with cattle, cut up the remaining litter and droppings from the cattle with a disc harrow, and turn it all under with a disc plow at least an inch deeper than the land was ever plowed before. Such treatment will give life to the soil as deep as the plow goes, and is good for potatoes as well as for any other crop.

Commercial fertilizers will of course have to be used to supplement the manures and restorative crops. The general impression has always been that potatoes require a fertilizer with a high percentage of nitrogen and potash and a relatively low percentage of phosphoric acid. Numerous experiments here have so far gone to show that the addition of potash to a fertilizer for potatoes has not materially increased the yield, and we believe similar results were obtained at the East Texas station. Evidently, therefore, the soils of South Mississippi and East Texas differ from those of the states farther east, since nearly all of these recommend for all vegetable crops, and especially for potatoes, a fertilizer with a high percentage of potash. For potatoes fresh animal manures are likely to prove harmful, as they are conducive to the growth and spread of scab, though they do not cause it. Such manures should be applied to a previous crop or sufficiently in advance of planting the potatoes to allow it to rot thoroughly. This station has conducted a number of experiments with fertilizers under potatoes, the work having been done before the soils were improved to any extent by restorative crops and before they had received any animal manures. The following table gives these results in detail, calculated in pounds of fertilizer per acre and in bushels of potatoes, though the plats were actually one-twentieth acre in size:

Plat.	Fertilizer—Pounds per Acre.					Yield in Bushels per Acre.				
	Cotton-seed Meal.	Nitrate of Soda.	Acid Phos-phate.	Kainit	Lime.	1903	1904	1905	1906	1907
1	214	100	456	224	0	93	84	103	48	62
2	107	50	456	112	0	106	85	94	52	
3	107	50	228	112	0	75	85	83	35	
4	214	100	456	0	0	104	86	94	31	58
5	0	0	0	0	0	25	43	43		
6	107	50	456		0			92		
7	214	100	456	224	1000	93	97			
8	107	50	228	0	0	60	67		40	

The Bliss Triumph is about the quickest maturing of all the varieties of Irish potatoes that do well in this section. It more nearly

meets the demands of the northern markets for which they are grown on account of their red color, but really they are not so good either in flavor or in yielding qualities as some of the other varieties that mature a few days later. Results here have shown the Peerless and Burbank decidedly better yielders, as will be seen from the following table. As a rule the Triumph should be ready for market in from one hundred to one hundred and ten days after planting, the Peerless and Burbank perhaps two weeks later, and the Early Rose and Early Ohio between these dates. The time of planting varies with the season and the latitude, of course, but in this latitude we have found that the potatoes will mature as early when planted the first of February as if planted a month earlier.

The following table gives the name and the yield of potatoes calculated in bushels per acre, the work having been done on plats of one-twentieth acre each:

Name.	Yield 1904.	Yield 1905.	Yield 1906.
Peerless	163	103	119
Tennessee Triumph	146		52
Burbank	182	166	111
Early Ohio	127		
Early Rose	137	73	113
Hebron		104	
Rural New Yorker		197	

We prefer always in spring to cut the seed potatoes before planting even though they are quite small, for experience at this station has shown that the cut potatoes sprout from one to two weeks quicker than whole potatoes. The size of the seed piece planted is also quite an important item. While the smallest piece will sprout well, the young plant has to depend for some time on the food stored in the mother potato; and if these are small, the young plant necessarily suffers. Reference to the table following will show that at McNeill we have gotten increased yields for every increase in the size of the seed piece; and from these results and other observations in growing the crop, we have concluded that that eight or ten bushels about represents the most economical quantity of seed for planting an acre.

Year	Size of Seed Piece.	Pounds Required to Plant Acre.	Yield Bushels.
1904	One-quarter (size guinea egg)	140	69
1904	One-half (size guinea egg)	310	80
1904	Three-quarters (size guinea egg)	540	97
1904	Whole potato (size guinea egg)	1200	108
1905	One-eighth (size hen egg)	350	97
1905	One-quarter (size hen egg)	500	100
1905	One-half (size hen egg)	860	137
1905	Whole potato (size hen egg)	1560	140

In tests here with home grown seed as compared to seed grown in Tennessee we have found that the potatoes grown farther north sprout quicker when planted and usually make better yields. The better yield may, however, have been due more to the fact that they got an earlier start than to their having been grown farther north, as the seasons in this latitude are usually more favorable in the earlier part of the growing season. Every crop of potatoes grown at this station has been attacked by the Colorado potato beetle. These beetles usually become much worse as the season advances, and while they may be controlled by arsenical dusts and sprays, these applications nearly always affect the foliage more or less.

Potatoes may be successfully grown in this section in the fall if the seed planted are first sprouted. This may easily be done by spreading them out in thin layers some weeks in advance of the time of planting, covering them lightly with sand, and keeping them damp for about two weeks before planting time. Fall potatoes should be planted here between the first and the fifteenth of July, or even up to the first of August. The potatoes from the spring crop that were too small to market make excellent seed for the fall crop. Irish potatoes grown in the fall are easily kept through the winter and are much less subject to rot than are the sweet potatoes.

Tomatoes.—During the first few years after this station was established a lot of work was done here with tomatoes, but on account of our excessively damp climate, particularly during the summer time, we found that rots and other troubles made the crop unprofitable. This would not apply to the entire long-leaf pine belt, but only to that part of it so near the coast as we are, about thirty-five miles. Records of the U. S. Weather Bureau show that a small strip of country extending along the Gulf coast from New Orleans to Mobile has a heavier rainfall than any other part of the United States except a certain part of Washington state along Puget Sound. In such a section as ours it looks a little like fighting nature to attempt to grow a crop so sensitive to fungous troubles as is the tomato, for such troubles are aggravated by damp weather. The tomato does fairly well here when planted on land rich in vegetable mold and fertilized with a substance with a high content of phosphoric acid; but even then the first and highest priced fruits will likely be destroyed by black rot, or what is generally known as blossum end rot. We have successfully controlled this trouble here by spraying with Bordeaux mixture, but this is expensive, and besides frequent showers interfere so seriously with its application and wash it off so badly when applied that we found this unreliable.

Onions.—The onion is one of the most reliable truck crops that can be grown in this section. It is comparatively free from insect pests and fungous diseases and can be grown during the fall and winter, when other farm operations are not so pressing. The crop requires a very rich soil and one particularly well supplied with humus. In fact, the best onion soils of the world are reclaimed marsh lands that are properly drained and are composed very largely of decayed organic matter. As for so many of the other vegetables mentioned here, the best preparatory treatment to be given a soil in this section for onions is to grow first a crop of velvet beans on the land and turn these under, then a crop of cowpeas during the early part of the succeeding year, either to be turned under or grazed off by cattle. The land for onions should be broken thoroughly several times during August and September and put in the very best mechanical condition. The onion seed should then be planted in the open field during the latter part of September in rows about thirty inches to three feet apart, after the land has been fertilized well with a heavy application of cottonseed meal and acid phosphate. Many more plants will come up than can grow on the land. These should be pulled out to a stand when they reach the size of a lead pencil, and may be used to set additional land. The young plants should be carefully cultivated and given an occasional dressing of nitrate of soda. They should reach full development about the latter part of April. They should then be gathered and stored or marketed as circumstances will determine. A good way to store them is to place them in regular onion crates which are piled so as to admit plenty of air and allow free circulation in a place as cool as possible. A potato house with double walls is a good place to store onions in summer. The white or yellow wax and the crystal wax are varieties that have done well in this section. Mr. J. J. Scarborough, of Poplarville, Miss., has been very successful in growing onions by the method just described.

Squash.—The squash is a crop that grows well in this section. A good many squashes have been grown in this part of the state and shipped along with beans to markets north of us where they have brought remunerative prices. The express rates are too high for such a bulky vegetable, so the crop has to be shipped by freight.

Cucumbers.—First-class cucumbers have been grown at this station repeatedly, but they have never been marketed at a profit, because the markets have been overstocked with greenhouse cucumbers grown in other places, particularly New Orleans. For pickling, this crop can be grown here at a profit. A large pickle factory has been started at Wiggins to handle the cucumbers grown in that com-

munity, but growing them for northern markets is quite different from growing them for pickling, and requires considerable expertness on the part of the producer. They are frequently badly injured in this section by a worm that bores into the fruit and ruins it for market.

Melons.—Several attempts have been made at this station to grow cantaloupes. Occasionally they have done well so far as the quality of the melons was concerned, but they have never been grown in quantities sufficient to ship by refrigerated freight, and the crop is relatively too cheap and heavy to be shipped at a profit by express. Besides, we have often failed completely to grow a cantaloupe that would sell at all on a discriminating market on account of worms that bore into the melon and cause it to decay. So bad have these worms been at times that we have failed to get a single cantaloupe fit to eat on the home table. These worms are very hard to combat successfully. At times we have failed utterly to keep them down, even when we resorted to all kinds of schemes to poison them, and even to hand-picking and to putting the melon when it formed into a paper bag. We certainly could not recommend such a crop as reliable for market, but it should be grown in the home garden.

Watermelons do well in this section. They have no serious insect enemies except the striped cucumber beetle, which at times injures the foliage considerably. There is no reason why melons might not be grown in this section and shipped in car lots to other markets, but it is a heavy crop and frequently will not pay the cost of moving, especially when they happen to come in a few days too late to catch the best markets. The writer believes that there is an opportunity in South Mississippi to grow a medium late crop of melons to be sold on southern markets after the crops of Florida and South Georgia have been sold. We know of a few men who have done fairly well with late melons which have been sold on southern markets. The water melon is generally grown in this section, but is sold entirely on local markets.

Lettuce and Radishes.—Both these crops may be grown in South Mississippi during the winter months, and a profitable industry has been built up along the Gulf coast at Long Beach and other points where the growers specialize on these two crops. We have grown these two crops and spinach at the station with marked success, but were never able to market them at a profit. There were several reasons for this: One was a lack of experience, but the main reason was that our place had no reputation on the markets, and the crops were grown in too small quantities to justify any systematic effort at finding suitable markets. The growing of all truck crops is attended with

considerable risks, for while the profits may be large, the losses too may be equally great. This is particularly the case in growing crops like lettuce and radishes in winter, when freezes are apt at any time to destroy them, and also where the profit or loss depends so largely on the kind of market on which they are sold. We could not recommend these crops to growers generally.

Conclusion.—The man who goes heavily into trucking and depends on it entirely is assuming a great risk, and a great many such men fail utterly in the end. At best it is a hazardous business, but when entered into in moderation and used along with other things to help out the farmer's income, it can be made a profitable line of farming. Truck crops should be grown only on the best land and in an intensive way, but enough people should engage in it in a trucking community to enable them to ship largely in car lots, and if possible to induce buyers to come among them and purchase their products right on the ground. This is better than having an agent on the markets to sell their products for them after they are shipped. Trucking can be carried along with the production of staple crops. As a rule some crop can always be grown on the land after the truck crop is removed, so that if the first crop fails the second one may still be depended on. Where conditions favor trucking so far as shipping facilities go, they are apt in this section to favor dairying, and as has been said, no two lines of work ever fitted together so well as do these two. A great many truck crops may be grown in South Mississippi during the fall and winter, when the land might otherwise be idle and when the help in the dairy is not at work growing feeds for the cattle. But the man who begins such work expecting to make profits of one hundred dollars and more per acre, had best confine his operations to a few acres, or his volume of business will prove disastrous to him.

Mississippi Agricultural Experiment Station

BULLETIN No. 164

COTTON EXPERIMENTS, 1913

AGRICULTURAL COLLEGE, MISSISSIPPI.

FEBRUARY, 1914.

TUCKER PRINTING HOUSE JACKSON MISS

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*In co-operation with U. S. Department of Agriculture.

Cotton Experiments, 1913.

Introduction.—In this bulletin are given the results from some of the cotton experiments for 1913 from the four Mississippi Experiment Stations. These are the Central Station at the A. & M. College, the McNeill Branch Station at McNeill, the Holly Springs Branch Station at Holly Springs, and the Delta Branch Station at Stoneville.

The results from similar cotton experiments previous to 1913 are published in Bulletins 155 and 161. These bulletins may be had upon application to the Director of the Experiment Station, Agricultural College, Miss.

The variety test at the Central Station does not seem to have been reliable, on account of the poor stands secured and the wilt and rust which was prevalent in the field, consequently the results of this test will not be published.

Results from the Central Station.

By J. R. Ricks.

THE WEATHER.

From the following table it will be noted that the rainfall here in 1913 was just about normal, inasmuch as the ten-year average is 52 inches.

Table 1.—Temperatures and Rainfall, 1913.

	Temperatures.				Rainfall.	
	Minimum.	Average Minimum.	Maximum.	Average Maximum.	Total rain-fall inches.	No of days on. which rain fell.
January	26	40.55	74	61.8	7.74	16
February	20	36.1	75	54.36	7.80	10
March	27	43.4	82	65.4	6.16	12
April	40	50.9	88	75.5	2.53	7
May	52	59.3	93	83.8	4.12	10
June	49	67	100	90.26	1.79	10
July	65	71.9	101	94.93	3.58	12
August	61	70.5	100	95.64	2.09	6
September	45	64.1	103	84.9	7.93	16
October	29	51.5	90	76	2.71	7
November	30	46.8	85	71	2.63	4
December	28	39.2	68	55.4	3.72	12
Total rainfall					52.80	122

RESULTS WITH FERTILIZERS.

Table. 2—Fertilizer Tests—Seven Years.

No. of Plat.	Fertilizer per Acre.	Yield of Seed Cotton—1907.	Yield of Seed Cotton—1908.	Yield of Seed Cotton—1909.	Yield of Seed Cotton—1910.	Yield of Seed Cotton—1911.	Yield of Seed Cotton—1912.	Yield of Seed Cotton—1913.	Average total yield of Seed Cotton—7 yrs.
1	Kainit 288 lbs.	1468	1940	1744	1352	904	952	1304	1380
2	Acid Phosphate 288 lbs.	1540	1688	1352	1656	1120	904	848	1301
3	C. S. Meal 288 lbs.	1268	1376	832	1232	1016	856	640	1071
4	No Treatment	1280	1384	1240	1192	936	784	592	1058
5	Manure 4 tons Lime 800 lbs.	1528	2432	1744	1528	1496	1336	1224	1612
6	C. S. Meal 288 lbs. Kainit 288 lbs.	1664	1912	1616	1536	984	976	1232	1417
7	C. S. Meal 288 lbs. Kainit 288 lbs. Acid Phosphate 288 lbs.	1760	1872	1592	1464	1064	1000	1456	1458
8	Manure 8 tons	1736	2352	2440	1856	2152	1448	2176	2027
9	Manure 4 tons Acid Phosphate 288 lbs.	1616	2032	1792	1592	1888	1048	1808	1682
10	Manure 4 tons Kainit 288 lbs.	1440	2096	1680	1496	1536	1192	1808	1607
11	Kainit 288 lbs. Acid Phosphate 288 lbs.	1296	1680	1624	1264	864	840	1076	1248
12	C. S. Meal 288 lbs. Acid Phosphate 288 lbs.	1040	1382	1040	1048	1000	624	800	961

Table 3.—Relative Earliness from Fertilizer Plats as Shown by the Different Pickings.

These plats are the same as those shown in the preceeding table.

No. of Plat.	Fertilizers per Acre.	Lbs. Seed Cotton per Acre first Picking.	Lbs. Seed Cotton per Acre second Picking.	Lbs. Seed Cotton per Acre third Picking.	Total yield Seed Cotton per Acre.
1	Kainit 288 lbs.	416	672	216	1304
2	Acid Phosphate 288 lbs.	464	320	64	848
3	C. S. Meal 288 lbs.	400	208	32	640
4	No Treatment	256	264	72	592
5	Manure 4 tons Lime 800 lbs.	256	744	224	1224
6	C. S. Meal 228 lbs. Kainit 288 lbs.	368	752	192	1312
7	C. S. Meal 228 lbs. Kainit 288 lbs. Acid Phosphate 288 lbs.	464	720	272	1456
8	Manure 8 tons	712	984	480	2176
9	Manure 4 tons Acid Phosphate 288 lbs.	824	744	240	1808
10	Manure 4 tons Kainit 288 lbs.	456	960	392	1808
11	Kainit 288 lbs. Acid Phosphate 288 lbs.	312	592	272	1176
12	Acid Phosphate 288 lbs. C. S. Meal 288 lbs.	512	248	40	800

Table 4.—Manure and Kainit to Prevent Rust, 1913.

PLAT.	First Picking Lbs. Seed Cotton per Acre.	Second Picking Lbs. Seed Cotton per Acre.	Third Picking Lbs. Seed Cotton per Acre.	Total yield Lbs. Seed Cotton per Acre.
Manure 10 tons per acre Applied 1910	680	980	140	1800
Kainit 400 lbs. per acre	640	470	80	1190
No Treatment	484	304	0	788
New manure 10 tons per acre	750	748	188	1686

We have never gotten any profitable results at this Station from the use of potash, which has for the most part been applied in the form of kainit, other than on soils where cotton rusts badly. During 1913 there was rust in practically all of our experimental plats except those to which had been applied barnyard manure and kainit. The increased yields from the use of nitrogenous and phosphatic materials have also been small. However, the reverse of this is true on the brown loam and piney woods soils of the state, since these fertilizers give profitable returns when used there. In all of our plats where acid phosphate was used we have noted that the cotton opened up much earlier in the fall.

DISTANCE EXPERIMENTS.

Table 5.—Width of Rows.

Results in 1913.

PLAT	Average Height in Feet.	First Picking Lbs. Seed Cotton per Acre.	Second Picking Lbs. Seed Cotton per Acre.	Total Yield Lbs. Seed Cotton per Acre.
5 ft. rows	4	870	40	910
4½ ft. rows	4	970	50	1020
4 ft. rows	4	1140	90	1230
3½ ft. rows	4	1330	180	1510
3 ft. rows	4	1580	200	1780

Table 6.—Distances in the Drill for 1913.

PLAT	First Picking Lbs. Seed Cotton per Acre.	Second Picking Lbs. Seed Cotton per Acre.	Third Picking Lbs. Seed Cotton per Acre.	Total Yield Lbs. Seed Cotton per Acre.
12 inches	523	1340	170	2040
20 inches	273	1172	163	1608
30 inches	246	807	147	1200

In the above experiment the rows were 3 feet, 8 inches apart and the cotton grew to about 4 feet in height.

Table 7.—Results from Picking up Squares Punctured by Boll Weevil.

PLAT.	Cost two Pickings.	Yield Seed Cotton per Acre.
1.—Squares picked	$3.00	792 pounds.
2.—No squares picked		527 pounds.

The weevils did not appear in large quantities until the latter part of August. The squares from the above plat were picked twice. The first were picked August 15th, and the last August 25th.

Results from McNeill Branch Experiment Station, 1913

By E. B. Ferris.

Introduction.—A good deal of work was done with cotton at the McNeill Station in 1913 and we consider it valuable mainly for what it taught us about the workings of the boll weevil. In 1912 practically as good yields of cotton were grown here as had ever been grown before the weevil appeared and we had indulged in the hope that this pest had grown less active, and that perhaps the time might come when cotton could again be grown here at a profit. We mentioned in the report for last year that the scarcity of the weevils in 1912 might have been due to unusually cold weather the winter before; but chiefly to the fact that the army worm had destroyed all the young growth on the cotton early in the fall of 1911 so that practically all the weevils starved between the time they got the last cotton in the fall and the first cotton the following spring. The winter preceding the crop of 1913 was a very mild one, no army worms destroyed the cotton foliage as had been the case the year before, and although dairy cows were allowed to eat the cotton leaves and stalks as soon as the picking season was over, the weevils began to appear in large quantities early in 1913, whereas in 1912 we had not been able to find more than a dozen weevils before the first of August. On account of the good results in 1912 a number of people were encouraged to plant a little cotton last year; however, not enough was grown to justify the operation of a cotton gin within reach of McNeill, and our cotton had to be shipped to Hattiesburg for ginning.

In 1913 twenty-six varieties of cotton were tested here in connection with similar work at the other stations in the state. The land on which this work was done is a typical sandy loam soil of the long leaf pine belt and the year before had grown a crop of corn, followed by cow peas. The peas had been grazed off by cattle and hogs and the corn stalks and the remains of the pea-vines were turned into the soil when the ground was bedded in the fall. On March 28, 1913, this ground was fertilized at the rate of 500 pounds per acre with a mixed fertilizer containing ten per cent of phosphoric acid and two per cent each of nitrogen and potash, and was immediately rebedded. These beds were then harrowed down to where they were only slightly higher than the average of the field and on April 9th the seed from the twenty-six varieties were planted with a Ledbetter planter. One row of each variety was planted in the order in which the varieties appear in the table and in this order

were repeated twice. Each row was four feet wide and contained one-thirty-sixth of an acre, so that the area of the three rows was one-twelfth of an acre.

This cotton did not come up to a perfect stand and had to be replanted one month later. The boll weevils appeared in great numbers early in the year, and for about one month from the time the first weevils were seen the cotton was picked over one or more times per week to catch these weevils. After this, the squares were so numerous that further picking of the weevils was impracticable. Then for several weeks the fallen squares were picked up and burned. With four years' experience in growing cotton here with the boll weevil, we have been convinced that under normal infestations it cannot be done at a profit, and that the people of this immediate section have been wise in discarding the crop almost entirely.

Anthracnose, or pink boll rot, appeared in great quantities in this cotton, also some rust and blight, so that in certain parts of the field almost no cotton was made, but this was confined largely to the lower and damper parts of the field. Since the several varieties were scattered over the land fairly uniformly they were all affected to somewhat the same degree. On the whole, however, we do not feel that the yields obtained under such unfavorable conditions are a very good index to either the relative or the actual merits of the several varieties. The fact is that growing cotton here even before the coming of the boll weevil was always done on a very narrow margin of profit, due to the diseases above mentioned and the frequency of summer showers which caused the cotton to shed its fruit. When, in addition to these, we have the boll weevil to fight, it is a practical impossibility to grow cotton profitably.

This cotton was gathered in two pickings and samples of the first picking were sent to the A. & M. College where they were ginned and records made of the percentages of lint, seed, etc. This information with yields per acre obtained here is given in detail in the table following:

Table 8.—Variety Test.

No. Plat	NAME OF VARIETY.	Weight of Pickings.		Total	Seed Cottor per acre	Per cent Lint	Yield Lint per acre
		Sept. 10	Oct. 3				
1	Lone Star	22	13	35	420	35	147
2	Rublee	30	12	42	504	34	171
3	Express	31	10	41	492	29	143
4	Calhoun	22	11.5	33.5	402	33	133
5	Columbia	16	7	23	276	31	86
6	Simpkins	31	8	39	468	35	164
7	Rowden	19	13.5	32.5	390	34	133
8	Sunflower	17	6.5	23.5	282	27	76
9	Triumph	16	8	24	288	38	109
10	Durango	23	9	32	384	32	123
11	Station Cook	19	6.5	25.5	302	38	115
12	Cleveland	19	7	26	312	35	109
13	Trice	27	8	35	420	31	130
14	Foster	28	7	35	420	31	130
15	Dodd's Favorite	32	12	44	528	30	158
16	Uncle Sam	21	10	31	372	35	134
17	Dodd's Prolific	37	7	44	528	31	164
18	Allen's Multiplier	29	6.5	35.5	426	31	132
19	Cook from Cook	35	10.5	45.5	546	38	207
20	Dixie	27	17	44	528	32	169
21	Wannamaker-Cleveland	33	12.5	45.5	546	37	202
22	Brandon	30	13	43	516	37	191
23	Truitt's 90-Day	28	9	37	444	33	147
24	Unknown	30	9	39	468		
25	Simpkins' from Simpkins	26	7	33	396	35	139
26	No Name	25	8.5	33.5	402		

Tests with fertilizers under cotton.—Thirty plats of land of one-twentieth acre each that had been fertilized the same way for a number of years were used for this work. Each test was made in triplicate and the plats fertilized the same way were so distributed over the entire acreage devoted to the work as to do away with variations in yield due to inequalities of the soil, and to make the average results more reliable than single plats would have done. This land had been devoted to tests with fertilizers under corn in 1912 and peas had been grown as a catch crop in the corn. After gathering the corn in the fall of 1912, cattle and hogs were allowed to glean the field and the land was bedded in the late fall so as to turn under all litter that had been left on it. On March 18, the several plats were fertilized as shown in the following table, the land was rebedded, and on April 10, Trice cotton seed were planted with a Ledbetter planter after the beds had been knocked down to where they were only slightly higher than the middles. This cotton had to be replanted one month later and the replants were too late to make under boll weevil conditions. Weevils were fought on this cotton the same as on the varieties above described, and squares were later picked up and burned when it was no longer possible to catch the weevils.

In addition to the thirty plats above described, four plats of land on what is known as the parked area were fertilized in two different ways and the results are reported in the table below:

Table 9—Fertilizer Test.

No. of Plat	Cotton-seed Meal.	Acid Phosphate	Kainit.	Raw Phosphate Rock.	Thomas Slag.	Yield of Seed Cotton calculated in lbs. per Acre.
1	0	0	0	0	0	43
2	200	0	0	0	0	210
3	0	200	0	0	0	300
4	0	0	200	0	0	120
5	200	200	0	0	0	440
6	200	200	200	0	0	496
7	200	0	0	200	0	447
8	200	0	0	0	400	330
9	400	200	0	0	0	530
10	200	400	0	0	0	453
11	200	200	0	Parked land		450
12	200	200	200	Parked land		390

Holly Springs Branch Experiment Station.

By C. T. Ames.

Remarks.—All of the fertilizer plats planted to cotton in 1913 were planted about as early as weather will permit in this latitude The growth was somewhat retarded early in the season on account of cool wet weather, but taking the season as a whole, it may be considered as normal.

Conclusions.—The use of both nitrogen and phosphorus, either alone or in combination, has given very satisfactory results.

Phosphorus hastens maturity and valley land that is slow in maturing a crop can be very greatly benefitted by its use.

The use of potash, either alone or in combination with other elements, appears to be unnecessary in these soils.

On thin uplands, the use of an equal mixture of acid phosphate and cottonseed meal, at the rate of 200 lbs. to 300 lbs. per acre gives very satisfactory results, and has done so for the past eight years. Two hundred pounds of this mixture has increased the yield of seed cotton in many instances over 500 lbs. per year. On the more fertile soils the quantity of phosphorus may be increased to advantage.

After leguminous crops, acid phosphate alone, 200 lbs. to 300 lbs. per acre, can be used to profit.

Where leguminous crops are to be grown (no legume will make satisfactory growth on the thin uplands of this section without the use of about two tons of crushed or ground limestone per acre), the use of 300 lbs. to 400 lbs. of rock floats under the legume will give good results.

Where the rock floats is mixed with manure, or with compost, the phosphorus is made available for plant use.

Holly Springs Branch Experiment Station.

Table 10.—Variety Test with Cotton.

Date of planting.—April 22, 1913. **Soil.**—Brown loam valley.
Plats.—One row each, repeated six times, making a total of 1-12.25 of an acre per each variety.

No. of Plat.	VARIETIES.	Weight of Pickings			Total per Plat.	Lbs. of Seed Cotton per Acre	Per cent of Lint	L'gth. of Staple	Lbs. Lint.	Lbs. Seed.	Total Value per Acre.
		Sept. 25.	Oct. 14.	Nov. 15.							
1	Dixie	26	44.5	43.5	114	1396	32%	7-8	447	949	$ 68.88
2	Brandon	27.5	37.5	45.5	110.5	1353	37%	1	500	853	76.39
3	Allen's Multiplier	31	34	39.5	104.5	1280	33%	5-8	422	858	64.96
4	Dodd's Prolific	37	45	46.5	128.5	1574	31%	1	488	1086	77.62
5	Truitt's 90 Day	32	39	49.5	120.5	1476	33%	3-4	487	989	75.05
6	Simpkins	38	40	39	117	1433	35%	7-8	502	931	76.89
7	Trice	49	50.5	51	150.5	1843	31%	1	571	1272	90.86
8	Rublee	41	42.5	47.5	131	1604	34%	3-4	545	1059	83.39
9	Ashcraft Double Jointed	31	45	43	119	1457	33%	1	481	976	75.93
10	Half & Half	40	40	46	126	1512	39%	3-4	590	922	87.43
11	Cook from Cook	45	44.5	46.5	136	1666	38%	7-8	633	1033	95.20
12	Cook from Station	35.5	41	43.5	120	1470	38%	1-2	558	912	83.19

Table 10—Variety Test With Cotton (Continued)

13	Wannamaker-Cleveland	47	47.5	53.5	148	1813	37%	7-8	671	1142	101.50
14	Cleveland Big Boll	40.5	46	44.5	131	1604	35%	1	561	1043	86.66
15	Triumph	39	41	46.5	126.5	1549	38%	1 1-16	588	961	89.92
16	Uncle Sam Big Boll	43.5	41	47	131.5	1610	35%	1 1-16	563	1047	87.67
17	Rowden	45.5	45	55	145.5	1782	34%	1 1-16	606	1176	94.99
18	Calhoun	41	45	50	136	1666	33%	1 1-16	550	1116	86.82
19	Lone Star	36.5	42	47.5	126	1543	35%	1 1-16	540	1003	84.08
20	Express	44.5	48.5	47.5	140	1721	29%	1 3-16	499	1222	90.12
21	Allen's Unknown	40	41.5	46	127.5	1562	31%	1 3-16	484	1078	84.86
22	Durango	35	43	36.5	114.5	1403	32%	1 3-16	449	954	78.14
23	Columbia	29	37.5	29	95.5	1169	31%	1 1-4	362	807	65.73
24	Foster (from College)	40	45	44	129	1580	31%	1 3-16	490	1090	85.88
25	Sunflower	34	40	32.5	106.5	1304	27%	1 3-8	352	952	71.74
26	Haaga No. 2	39	38	34	111	1360	28%	1 3-8	371	989	75.43
27	Dodd's Prolific	43.5	46	43.5	133	1629	30%	1 1-8	488	1141	82.58
28	Foster (from Haaga)	46	42	43.5	131.5	1609	31%	1 5-16	499	1110	93.71

Remarks.—Values on cotton of different staples at Aberdeen, Miss.; based on market of October 16th, New York futures for January closing at 12.05 on that date. All values based on strict middling grade:

$\frac{3}{4}$ inch, 12 7-8 cts.; 7-8 inch, 13 cts.; 1 inch, 13 1-8 cts. Full inch to 1 1-16, 13 1-4 cts. Full 1 1-16 to 1 1-8, 13 1-8 cts.; full 1 1-8 to 1 3-16, 14 cts. 1 3-16, 14 3-4 cts.; 1 3-16 full, 15 cts.; 1 $\frac{1}{4}$, 15 3-8 cts.; 1 $\frac{1}{4}$ full, 15 3-4 cts. 1 5-16, 16 cts.; 1 $\frac{3}{8}$, 17 cts.

Table 11.—Fertilizer Test with Cotton.

Date of planting.—April 23, 1913. **Variety.**—Cleveland Big Boll. **Soil.**—Rolling hill land. **Plats.**—1-20 acre each.

No. of Plat.	200 Lbs. Fertilizer Per Acre.	Weight of Pickings. Sept. 25.	Weight of Pickings. Nov. 5.	Total.	Lbs. Seed Cotton per Acre.	Total value at 5c lb. for Seed Cotton.
1	No Fertilizer	0	10	10	200	$10.00
2	200 lbs. Cottonseed Meal	3.5	23	26.5	530	26.50
3	200 lbs. Acid Phosphate	13	25	38	760	38.00
4	200 lbs. Kainit	0	16.5	16.5	330	16.50
5	No Fertilizer	0	11.5	11.5	230	11.50
6	100 lbs Cottonseed Meal 100 lbs. Acid Phosphate	9.5	27	36.5	730	36.50
7	100 lbs. Cottonseed Meal 100 lbs. Kainit	2	21	23	460	23.00
8	100 lbs. Acid Phosphate 100 lbs. Kainit	5.5	23.5	29	580	29.00
9	120 lbs. Acid Phosphate 40 lbs. Cottonseed Meal 40 lbs. Kainit	8	23.5	31.5	630	31.50

	400 Lbs. Fertilizer Per Acre.	Weight of Pickings. Sept.. 25.	Weight of Pickings. Nov. 5.	Total	Seed Cotton per Acre.	Total value of Seed Cotton at 5c per pound.
6½	200 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	0	26	26	520	26.00
7½	200 lbs. Cottonseed Meal 200 lbs. Kainit	0	31	31	620	$31.00
8½	200 lbs. Acid Phosphate 200 lbs. Kainit	10.5	26	36.5	730	36.50
9½	240 lbs. Acid Phosphate 80 lbs. Cottonseed Meal 80 lbs. Kainit	7	23.5	30.5	610	30.50

Table 11—Fertilizer Test With Cotton. (Continued.)

10	No Fertilizer	1	11	12	240	12.00	10½	No Fertilizer	0	10.5	10.5	210	10.50
11	150 lbs. Cottonseed Meal 50 lbs. Acid Phosphate	10	22	32	640	32.00	11½	300 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	16	34	50	1000	50.00
12	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	12	21	33	660	33.00	12½	200 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	13	26	39	780	39.00
13	50 lbs. Cottonseed Meal 150 lbs. Acid Phosphate	9	20	29	580	29.00	13½	100 lbs. Cottonseed Meal 300 lbs. Acid Phosphate	9	19	28	560	28.00
14	No Fertilizer	0	10	10	200	10.00	14½	No Fertilizer	0	14	14	280	14.00

Remarks.—All of these plats were located in the field as indicated in this table, with only a six foot space between the two sets of plats.

Each of the above plats have been fertilized, each year, for the past eight years, with the same kind and quantity of fertilizer as indicated in table.

Table 12.—Fertilizer Test with Cotton.

Date of planting.—April 24, 1913.

Soil.—Rolling hill land.

Plats.—One-twentieth acre each.

Variety.—Variety of cotton, Cleveland Big Boll.

No.	Lbs. Fertilizer Used.	Weight of Pickings.		Total.	Lbs. of Seed Cotton.	Total Value of of Seed Cotton at 5c per Pound.
		Sept. 25.	Nov. 4.			
1	No Fertilizer	4.5	17	21.5	430	$ 21.50
2	200 lbs. Cottonseed Meal	5	23	28	560	28.00
3	200 lbs. Acid Phosphate	7	24	31	620	31.00
4	200 lbs. Kainit	3	13	16	320	16.00
5	No Fertilizer	7.5	13	20.5	410	20.50
6	200 lbs. Rock Floats	6	21	27	540	27.00
7	400 lbs. Rock Floats	9	24	33	660	33.00
8	200 lbs. Acid Phosphate	11	20	31	620	31.00
9	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	8	25	33	660	33.00
10	100 lbs. Cottonseed Meal 200 lbs. Rock Floats	1	29	30	600	30.00
11	No Fertilizer	0	23.5	23.5	470	23.50
12	100 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	8.5	19	27.5	550	27.50
13	200 lbs. Acid Phosphate	2.5	17.5	20	400	20.00
14	400 lbs. Rock Floats	1.5	21	22.5	450	22.50
15	200 lbs. Kainit	5.5	16	21.5	430	21.50
16	No Fertilizer	4.5	15	19.5	390	19.50
17	200 lbs. Rock Floats	6.5	15	21.5	430	21.50

Table 13.—Fertilizer Test with Cotton.

Date of planting.—May 1, 1913 **Soil.**—Red clay table land. **Plats.**—Six rows four feet wide and ninety-two feet long, making one-twentieth acre each. **Variety.**—Trice.

		Yield of Seed Cotton			Yield of Seed Cotton			Yield of Seed Cotton
1	1000 lbs. Air-slacked Lime	780 lbs.	5	200 lbs Acid Phosphate	800 lbs.	9	200 lbs Cottonseed Meal	900 lbs.
2	No Fertilizer	640 lbs.	6	200 lbs. Kainit 100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	780 lbs.	10	200 lbs. Untreated Phos. Rock	880 lbs.
3	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	810 lbs.	7	100 lbs. Kainit	820 lbs.	11	No Fertilizer	890 lbs.
4	200 lbs. Untreated Phos. Rock	720 lbs.	8	No Fertilizer	890 lbs.	12	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate 100 lbs. Kainit	1050 lbs.

Remarks.—Plats are located in the field as indicated in above table. Soil is cold clay land, cotton made a very slow growth.

Table 14.—Fertilizer Test with Cotton.

Date of planting.—May 10, 1913.

Soil.—Very poor red clay hill land.

Plats.—One-twentieth acre each.

Variety.—Trice.

		Yield of Seed Cotton			Yield of Seed Cotton
1	200 lbs. Acid Phosphate	430 lbs.	5	No Fertilizer	360 lbs.
2	200 lbs. Basic Slag	520 lbs.	6	400 lbs. Acid Phosphate	390 lbs.
3	No Fertilizer	370 lbs.	7	400 lbs. Basic Slag	540 lbs.
4	400 lbs Untreated ground Phosphate Rock				480 lbs.

This Plat (4) extends length of both sets of plats, as indicated in table.

Remarks.—The basic slag contains about 50% of free lime and from 15 to 17 % phosphorus. It would appear that this slag has given the best results. There is no question but these soils are deficient in both lime and phosphorus.

Results from the Delta Branch Station

By G. B. Walker.

Variety test.—In the following table is given a list of forty-five varieties of cotton tested at the Delta Branch Station at Stoneville, Miss., in 1913, with data which gives the showing made by each variety.

This test was planted on May 7th, on fairly well drained loam soil that has been in cotton for several years. No fertilizer at all was used.

The season at the Delta Station during 1913 was nearly ideal and the yields were all very high, particularly so with the late varieties, as compared with 1912 yields. It will be remembered that the 1913 season was a very long one and it should be borne in mind when studying this table that the late varieties made a better final showing than can be expected of them in an average season, especially with a heavy infestation of boll weevil. By comparing weights of seed cotton at first and second pickings one should be able to judge, to some extent, the relative earliness of the different varieties. However, if the first picking could have been made earlier the differences at this picking would have been more marked.

Samples of lint from all the varieties were classed at Aberdeen, Leland, and Greenville, but our valuations are based on Greenville classification and valuations.

Boll weevil did not appear here until late in the season and hardly affected the yields at all.

Table 15.—Variety Test.

VARIETY.	Character of Foliage	Lbs. Seed Cotton per acre 1st pkng. Oct 1st.	Lbs. Seed Cotton per acre, Second picking.	Total yield of S. C. per acre.	Yield of lint per Acre.	Percentage of Lint.	Length of Staple according to Greenville classification.	Character of Lint.	Price per lb. of strict mdng gd Nov. 1st mkt.	Value of Lint per Acre.	Val. of Seed per Acre at $20.00 per ton.	Total value of lint and seed per acre.	Rnk as to money value pr acre
Half and Half	Medium	1284	943	2227	846	38%	7-8	Fair	$ .13 5/8	$ 115.25	$13.81	$ 129.06	1
Wannamaker-Cleveland	Medium	1566	690	2256	835	37%	1	Good	.13 3/4	114.81	14.21	129.02	2
Express	Light	1740	542	2282	662	29%	F. 1 1-8	Good	.16	105.92	16.20	122.12	3
Triumph	Dense	1066	900	1962	746	38%	1 1-16	Good	.14 1/2	108.17	12.16	120.23	4
Cook's Cook	Dense	1236	851	2087	793	38%	3-4	Poor	.13 1/2	107.05	12.94	119.99	5
Unknown	Medium	1494	567	2061	639	31%	F. 1 3-16	Good	.16 1/2	105.43	14.22	119.65	6
Tommy	Medium	1302	839	2141	642	30%	F. 1 1-8	Good	.16	102.72	14.99	117.71	7
Miller	Dense	1092	958	2050	718	35%	F. 1 1-16	Good	.15	103.70	13.32	117.02	8
Hartsville	Dense	690	1250	1940	621	32%	1 3-16	Good	.16 1/2	102.46	13.19	115.65	9
Dixie	Medium	918	1349	2267	725	32%	1	Fair	.13 3/4	99.68	15.42	115.10	10
Uncle Sam	Medium	1056	946	2002	700	35%	1 1-16	Fair	.14 1/2	101.50	13.02	114.52	11
Richmond Bender	Medium	1464	690	2136	662	31%	F. 1 1-16	Good	.15	99.30	14.74	114.04	12
Calhoun	Dense	1134	946	2080	686	33%	1 1-16	Good	.14 1/2	99.47	13.94	113.41	13
Cleveland	Dense	1158	874	2032	711	35%	C. 1 1-16	Good	.14	99.54	13.21	112.75	14
Metcalfe	Light	1536	506	2042	633	31%	1 1-8	Good	.15 1/2	98.11	14.09	112.20	15
Sherard's Columbia	Dense	744	1188	1932	599	31%	C. 1 1-4	Good	.16 1/2	98.83	13.33	112.16	16
Durango	Medium	1068	660	1728	553	32%	F. 1 1-8	Good	.16	100.14	11.75	111.89	17
Rowden	Dense	1068	912	1980	673	34%	1 1-16	Good	.14 1/2	97.68	13.07	110.75	18
Brandon	Light	1296	736	2032	752	37%	3-4	Poor	.13 1/2	97.87	12.80	110.67	19
Acala	Medium	1032	784	1816	636	35%	1 1-8	Good	.15 1/2	98.58	11.80	110.38	20
Webber	Dense	696	1257	1953	605	31%	F. 1 1-8	Good	.16	96.18	13.48	110.28	21
Keno	Light	1344	651	1995	579	29%	1 3-16	Good	.16 1/2	95.53	14.16	109.69	22
Ashcraft	Dense	1224	759	1983	654	33%	1 1-16	Good	.14 1/2	94.83	13.29	108.12	23
Haaga No. 2	Medium	960	851	1811	507	28%	1 7-16	Good	.18 1/2	93.79	13.04	106.83	24

Table 15.—Variety Test. (Continued)

VARIETY	Character of Foliage.	Lbs. Seed Cotton per acre 1st pkng. Oct. 1st.	Lbs. Seed Cotton per acre, Second picking.	Total yield of S. C. per acre.	Yield of lint per acre.	Percentage of Lint.	Length of Staple according to Greenville classification.	Character of Lint.	Price per lb. of strict mdlng gd Nov. 1st mkt.	Value of Lint per acre.	Val. of Seed per acre at $20.00 per ton.	Total value of lint and seed per acre.	Rnk as to money value pr acre
Lone Star	Dense	798	1019	1817	636	35%	F. 1 1-16	Good	.14¾	93.81	12.81	106.62	25
Rublee	Light	1260	736	1996	679	34%	1	Fair	.13¾	93.35	13.17	106.52	26
Peerless	Light	1230	750	1980	594	30%	1 1-8	Good	.15½	92.07	13.86	105.93	27
Foster	Light	1164	660	1824	565	31%	1 3-16	Good	.16½	93.22	12.59	105.81	28
Richmond Long Staple	Light	1368	555	1923	558	29%	1 3-16	Good	.16½	92.07	13.65	105.72	29
Dodd's Favorite	Light	1332	697	2029	609	30%	C. 1 1-8	Good	.15	91.35	14.20	105.55	30
Trice	Light	1518	506	2024	627	31%	1 1-16	Good	.14½	90.91	13.97	104.88	31
Dodd's Prolific	Light	1488	529	2017	625	31%	1 1-16	Fair	.14½	90.62	13.92	104.56	32
Kentucky Bender	Light	1440	572	2012	624	31%	1 1-16	Poor	.14½	90.48	13.88	104.36	33
Sunflower	Light	1296	544	1840	497	27%	1 3-8	Good	.18	89.46	13.43	102.89	34
Haaga No. 1	Dense	576	1150	1726	535	31%	1 1-4	Good	.17	90.95	11.91	102.86	35
Davis Long Staple	Light	1158	667	1825	511	28%	1 5-16	Good	.17½	89.42	13.14	102.56	36
Mary Mac Special	Light	1134	636	1770	496	25%	1 5-16	Good	.17½	86.80	12.74	99.54	37
Foster Haaga	Light	956	667	1623	503	31%	F. 1 3-16	Good	.17	85.51	11.20	96.71	38
Station Cook	Dense	900	782	1682	639	38%	3-4	Poor	.13½	86.26	10.43	96.68	39
Columbia	Dense	924	885	1709	530	31%	1 3-16	Good	.16	84.80	11.17	96.59	40
Simpkins	Light	1350	414	1764	617	35%	3-4	Poor	.13½	83.29	11.47	94.76	41
Keenan	Dense	660	857	1517	501	33%	1 3-16	Good	.16½	82.66	10.16	92.82	42
Multiplier	Light	1542	253	1795	592	33%	3-4	Poor	.13½	79.92	12.03	91.95	43
Ninety-Day	Light	1266	506	1772	585	33%	3-4	Poor	.13½	78.97	11.87	90.84	44
Black Rattler	Light	792	846	1638	442	27%	1 3-16	Good	.16½	72.93	11.96	84.89	45

AVAILABLE BULLETINS AND CIRCULARS.

The following bulletins and circulars of the Station may be had upon request:

BULLETINS.

No.
84—Report of Field Work at the College Station for 1903.
90—San Jose' Scale.
94—Report of Work at the McNeill Branch Station for 1905.
104—Inspection and Analyses of Cottonseed Meal.
122—Report of Work at the Holly Springs Branch Station for 1908.
139—The Boll Weevil in Mississippi, 1909.
140—Cotton Diseases in Mississippi.
141—Control of Diseases of Fruits, Flowers, and Vegetables.
145—Inspection and Analyses of Commercial Feeding Stuffs.
146—Suggestions for Growing Home Fruits.
147—Apple Growing in Mississippi.
148—Inspection and Analyses of Cottonseed Meal.
149—Inspection and Analyses of Commercial Feeding Stuffs.
150—Inspection and Analyses of Commercial Fertilizer.
151—Inspection and Analyses of Cottonseed Meal.
152—Inspection and Analyses of Commercial Feeding Stuffs.
153—Inspection and Analyses of Commercial Feeding Stuffs.
154—Inspection and Analyses of Commercial Feeding Stuffs.
155—Recent Cotton Experiments.
156—Inspection and Analyses of Cottonseed Meal.
158—Report of Work at the McNeill Branch Station for 1907-1911.
159—Clearing Pine Lands.
160—The Cut Over Lands of South Mississippi.
161—Cotton Experiments, 1912.
162—Cottonseed Meal as a Feed for Laying Hens.
163—Truck Crops for South Mississippi.

TECHNICAL BULLETINS.

No.
2—Some Scale Insects of Mississippi.
3—Form and Structure of Certain Plant Hybrids in Comparison with the Form and Structure of their Parents.
4—The Soils of Mississippi.

CIRCULARS.

Blackleg.
Boll Weevil.
Insect Pest Law.
Underground Waters of Mississippi.
Tuberculosis in Dairy Cattle.
Report of Work on Alfalfa at the Holly Springs Branch Station.
Diseases Prevalent among Horses and Cattle in Mississippi.

Address,

AGRICULTURAL EXPERIMENT STATION,
Agricultural College, Mississippi.

Mississippi Agricultural Experiment Station

BULLETIN No. 165.

REPORT OF THE WORK DONE AT HOLLY SPRINGS BRANCH EXPERIMENT STATION, 1913

By C. T. AMES.

FIG. 1.—BADLY ERODED LAND WHICH HAS BEEN PUT BACK INTO CULTIVATION.

AGRICULTURAL COLLEGE, MISSISSIPPI

JANUARY, 1914.

TUCKER PRINTING HOUSE JACKSON MISS

STATION STAFF.

G. R. HIGHTOWER.....President

E. R. LLOYD.....Director and Animal Husbandman

W. F. HAND.....Chemist

W. N. LOGAN.....Geologist

J. S. MOORE.....Dairy Husbandman

A. B. McKAY.....Horticulturist

R. W. HARNED.....Entomologist

DANIELS SCOATES.....Agricultural Engineer

H. B. BROWN.....Botanist

E. M. RANCK.....Veterinarian

J. R. RICKS.....Agronomist

C. F. BRISCOE.....Bacteriologist

E. C. EWING.....Cotton Breeding

A. SMITH.....In Charge of Beef Cattle Work

E. P. CLAYTON.....Poultryman

A. G. HALL.....Drainage Engineer*

R. N. LOBDELL.....Assistant Entomologist

J. M. BEAL.....Assistant Botanist

MISS SIDNEY GAY.....Stenographer

E. B. FERRIS.....Assistant Director, McNeill Station

C. T. AMES.....Assistant Director, Holly Springs Station

G. B. WALKER.....Assistant Director, Delta Station

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*In co-operation with U. S. Department of Agriculture.

SOIL EROSION

The desire to ascertain a practical and satisfactory method of controlling soil erosion in the northern section of Mississippi, no doubt had more to do with the location of this Branch Agricultural Experiment Station in this section, than any other one thing. Soil washing is the curse of the area surrounding the Station. The existing conditions that are found in the Brown Loam area—the light silty soil, with sandy foundation in many instances—are peculiarly favorable to easy and excessive erosion, and during the half century or more that these lands have been cultivated, the erosion has been most extensive and appalling. Originally these soils were very productive, and such is the case today where the original soils are found. Just as these soils wash easily, so is it easy and inexpensive to fill the smaller gullies and washes. After a gully gets to be 6, 8, or 10 feet deep, it becomes very much more difficult to fill. Underneath these soils, at a depth of about three feet, we strike in many instances a whitish, hard, impervious clay that is very hard to work. In many instances also we find a reddish soil that somewhat approaches sandstone in texture. The two subsoils described above, when exposed to the weather, denudate very rapidly, especially after freezes. The rains that follow these freezes wash out of the gullies the soil that has sloughed off and in many instances deposit it in the valleys. The tendency of the country is to level up. There are thousands of acres of steep hills in this section that should never have been cleared. Since this has been done, however, they should have been sodded to bermuda grass and lespedeza and utilized as pasture, and it may be stated here that this is the thing to do today where possible. We will discuss this point more fully elsewhere in this bulletin.

The following pictures show a class of work that has been done at this Station. It should be remembered that a photograph can take in a very small scope. However, we shall depend almost entirely on the following pictures to do the talking, stating only that we depended almost entirely upon mules and darkey labor to do the work. The common drag scraper and a turning plow were the only tools used except the mattock and spade used in edging the gullies so the teams would take them. We used some dynamite to advantage, but found the teams and labor the cheapest in most instances. This class of work was done during the winter months when but little else could be done.

FIG. 2.—CONTROLLING SOIL EROSION.

From Left to Right, Top Row.—Station residence from northwest corner of lot, before work was done. On right after completion.

Bottom Row on Left.—Station residence from rear after a snow. On the right, several years later, after the gullies were filled.

FIG. 3.—CONTROLLING SOIL EROSION.

From Left to Right, Top Row.—View of old mule barn before improvements were made. View of new mule barn built on old foundation after improvements.

On the Left, Bottom Row.—A more distant view of mule barn. On the Right.—View after improvements were made.

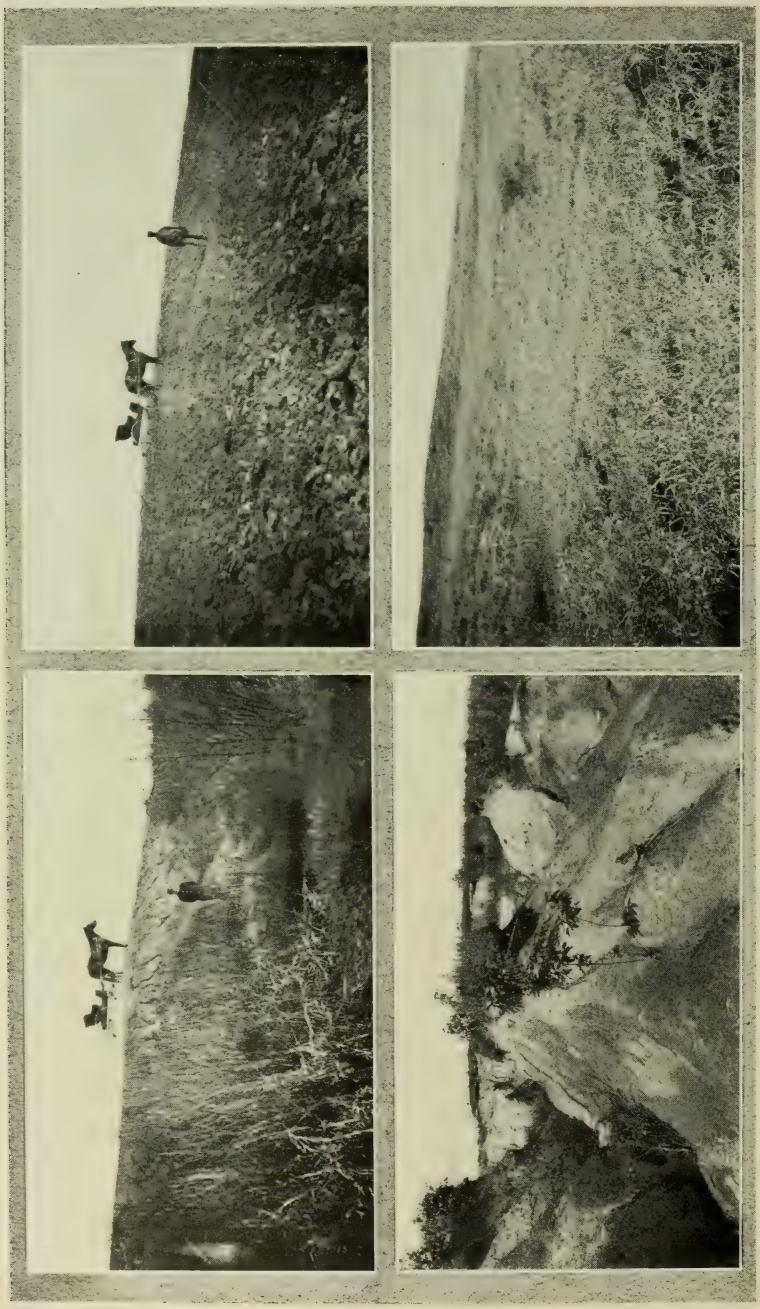

FIG. 4. CONTROLLING SOIL EROSION.
Top Row on the Left.—A gully 100 yards long. On right from same viewpoint after gully was filled.
Bottom Row.—On left, a typical gully of this section. On right from same viewpoint, two or three years later.

FIG. 5.—CONTROLLING SOIL EROSION BY DYNAMITE.
From Left to Right, Top Row.—A gully before dynamite is used. On Right.—Same gully after $1.00 worth of dynamite is used.
Bottom Row on Left.—Gully before dynamite is used. On Right.—The same gully after $3.00 worth of dynamite is used.

FIG. 6.—CONTROLLING SOIL EROSION.

Top Row on the Left.—A system of ponds or gullies connected by a terrace so as to carry off excessive water after rains. On Right.—Black locust plantings on gullied lands to check soil washing, and as a method of gully filling.
Bottom Row on Left.—Wild honeysuckle growing on the bank of a gully, which checks erosion. On Right.—Narrowing a sand ditch or drain and sodding banks in bermuda grass to replace timber growth.

GULLY FILLING.

The foregoing pictures show the different methods we have employed in gully filling. Gullies have been filled on the Station grounds that cost all the way from $1.00 to $75.00 per acre. Where the gullies are small, it is a very easy matter to fill with turning plow and drag scraper. When the gullies are much larger, satisfactory results can be had by running terraces about 75 yards apart on the hillsides. These terraces will simply be a system of ponds joined together by drains. During excessive rains these drains carry off the surplus water, which prevents the ponds from overflowing. These ponds will catch all of the soil that is washed from the sides of the hill, and after a time, with the assistance of a sod of some kind such as bermuda grass, or wild honeysuckle, or plantings of black locust, even the worst of these gullies will produce a revenue. A plow can be used to good advantage in many places between and on the edge of these gullies to assist nature in the filling. Even if the terraces are not used, the sod or black locust plantings will assist greatly in checking the erosion, and will extend a hope of future revenue, which no man can expect as many of the gullies stand today.

To Prevent Soil Washing.—Anything that will hold the soil in place, such as a sod of bermuda or lespedeza, is excellent; any device that will control the running water so as to make it move slowly is more or less helpful and satisfactory.

Three methods of terracing have been developed with the view to prevent washing. The first is to have a system of level embankments about four feet wide and eighteen inches high. The rows are level and parallel to the embankment. This method is employed where both surface and subsoil are porous and absorb water rapidly. It aims at holding the water practically where it falls until it has soaked into the soil.

The second system of terracing follows the plan of letting the surplus water run, but, by means of rows and embankments, making it run more slowly. To accomplish this, each embankment and each row is given a little fall—the embankment being required to do the bulk of the work.

The third system aims at producing by a method of plowing, real terraces or comparatively level areas on the side or slope of the hillside. To accomplish this, lines of level are run the same as in system one, but no embankments are made. A hillside plow that turns all furrows down hill is always used in breaking.

The second system is the one used on the Station farm. The embankment is essentially a very much enlarged hillside ditch, the bottom being from four to six feet wide and the bank from six to ten wide and about eighteen inches high. Implements can be used and this broad, shallow ditch and broad embankment on gently sloping hillsides can be crossed with rows and so cultivated as to lose very little land. Thus it can be kept as free from weeds and grass as other parts of the field. See figure number 7.

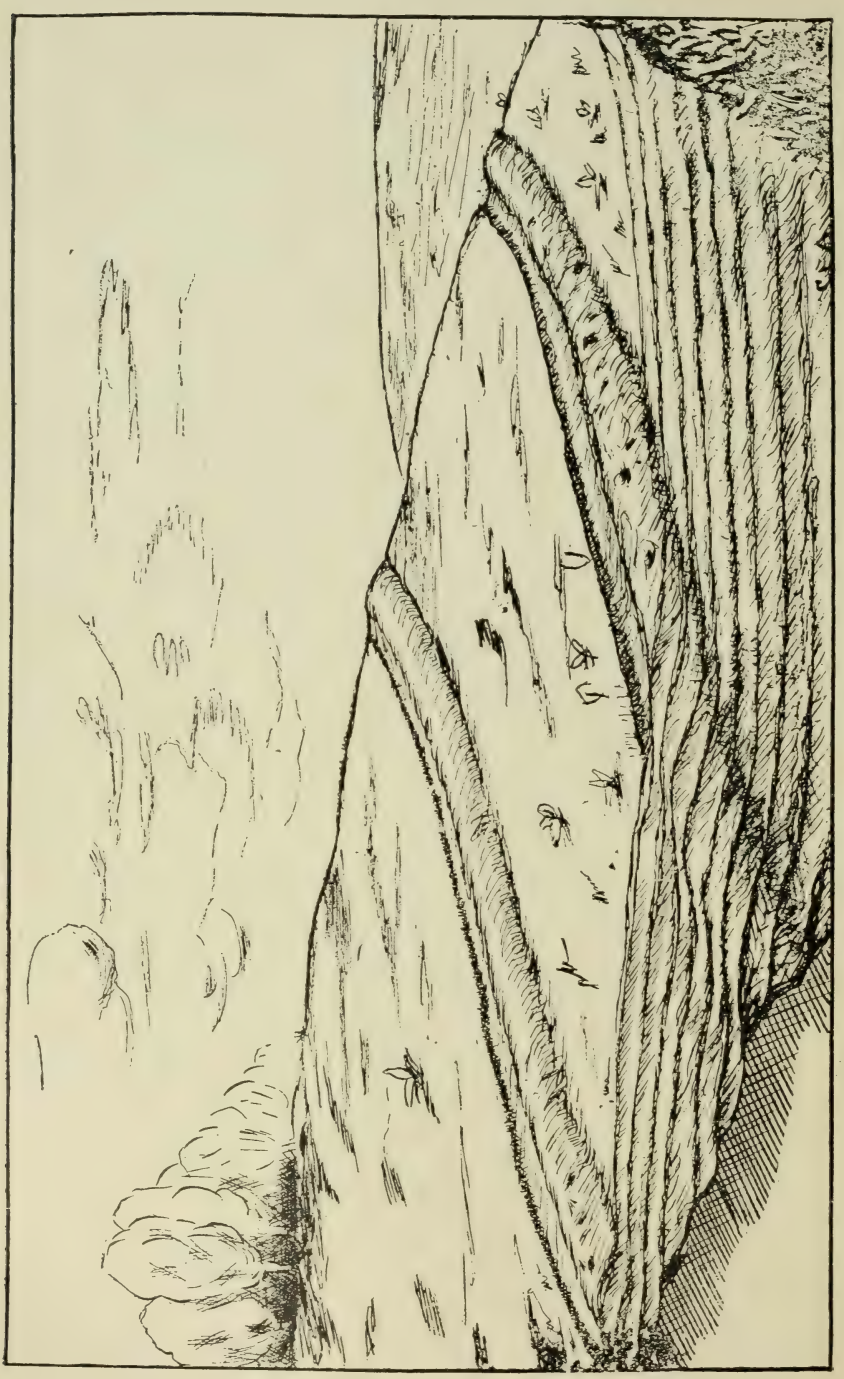

FIG. 7.—SHOWING GRADED EMBANKMENTS WITH ROWS CROSSING.

Where the hillside is more sloping, in this character of soil, it is best not to break the slope of the embankment but to use the terrace as a turn row. The loss of land in this system is not as great as in either of the other systems. In the South, where the rainfall is heavy, and on clay soils especially, this is the system to be used. This Station has about 15 miles of this style of terrace, and with the assistance of winter cover crops, soil washing is reduced to a minimum. We have found it necessary in very many instances to grade the uneven places with scrapers to get the best results in controlling the surplus water. Any low place will get lower after each rain, and it will be found inexpensive to use the plow and scraper on such places.

Laying Off a Terrace.—Use a level to obtain a uniform fall. Any cheap farm level can be used. The one used by this Station has a telescope and cost $15.00. Any place along the line of the proposed terrace may be used as a starting point. Seven inches fall to every 100 feet is enough, both for rows and terraces, but less may be used where the hillside is smooth and not very steep. After selecting the starting point, place the level at some convenient place that will keep the rodman the longest time within the range of the telescope. Level the instrument and keep it level. With rodman at starting point put down a stake. Then have the rodman raise or lower the target until on a line with cross wires of the telescope. Assuming, for description, that the mouth (or lowest part) of the terrace is selected as the starting point, let the rodman step 20 steps, or about 60 feet, in the direction the terrace is to run and lower the target four inches on the rod. Now let him move the rod up or down the hill until the target is again on a line with the cross wires in the telescope. When this point is found, stick up a stake. Again lower the target four inches on the rod and step in direction of terrace about 60 feet and locate second point as described above, and put down a stake and so continue to the end. When necessary to move the level, proceed as given for the first point, using the last stake set before moving as a new starting point for the second position of the level. When the stakes are all set, they are to be used as guides. The real line of the terrace is now made with a plow with the instrument man as a pilot ahead of the team. Getting an embankment or ditch properly located and with the right kind of curves is always a matter that must depend more or less on the judgment of the pilot, or man who walks in front of the team. Small irregularities of the surface affect the location of stakes and are ignored to some extent

in locating the exact line of the terrace. Use the stakes as a general guide only. A plow and scraper will obliterate the little irregularities in the construction.

Making a Terrace.—When the line of terrace or ditch has been determined, plow four to six furrows, turning the soil down the hill each time. Remove this plowed soil with a common drag scraper, making an embankment immediately below the plowed soil. A surface scraper, triangle drag, or road machine may be employed in this work. Make all terraces large enough to handle water after the heaviest rains.

As a general rule, the water in a terrace should run in the opposite direction to the water in the main drain into which it empties; that is, up the valley. The water in the rows should run in the same direction as the water in the main drain, or down the valley. (See figure No. 7). If an attempt is made to run the water in a terrace in the same direction as the water in the main drain, it can be readily seen that the fall of the terrace will have to be greater than that of the drain, or the terrace could not empty into it. In most instances this would be too great a fall.

The perpendicular distance between terraces may range between 4 and 8 feet according to the grade of the land. The distance apart should govern this point.

It is advisable to begin terracing at the upper end of a slope, so that the amount of water that should enter the terrace can be controlled.

Terrace the best and most productive part of your farm first, then the next best, and so on until the whole farm is terraced. If you begin on the gullied land, the chances are that you will become discouraged.

Terraces can be made at $1.00 per 100 yards, allowing for labor only. On gullied land the cost would be greater. This work should be done in late fall and winter when little else can be done.

VARIETY TEST WITH CORN.

Soil.—Valley land.

Date of Planting.—April 3, 1913.

Plats.—One row each, repeated five times, making a total of 1/14.7 acres to each variety, rows four feet wide.

	Name of Variety.	Yield in bushels per acre.
1.	Cocke's Prolific	53.3
2.	Batts' 4 Ear	52.
3.	E-1	49.4
4.	Hickory King	30.5
5.	Silver Mine	40.5
6.	Poor Land (E. B. Anderson)	39.6
7.	Cocke's Prolific (J. B. Allen)	55.9
8.	Square Deal	36.7
9.	Boone County White	47.1
10.	Welchell	44.7
11.	Hastings' Rockdale	36.7
12.	Reid's Yellow Dent	40.5
13.	Munson	47.1
14.	North Carolina Prolific	48.
15.	Funk's 90 Day	34.7
16.	Gourd Seed	44.9
17.	Eureka (Ensilage)	48.2
18.	Florida Flint	39.6
19.	Mosby (Station)	43.
20.	St. Charles	42.2
21.	Cocke's Prolific (from Nashville)	53.7
22.	Davis' Prolific	49.8
23.	Jones' Prolific	49.4
24.	Leaming (Northern grown)	30.5
25.	Hastings' Prolific	47.1
26.	Vardaman's Stooling Corn	57.8

Remarks.—The seed corn used in this variety test was secured from the growers in most instances and from seed houses only when necessary.

The yield was not what it should have been, as the corn was blown down about the time it began to shoot. It never fully recovered, and this prevented proper cultivation.

VARIETY TEST WITH COTTON.

Date of Planting.—April 22, 1913. **Soil.**—Brown loam valley.
Plats.—One row each, repeated six times, making a total of 1-12.25 of an acre per each variety.

VARIETY	Dates of Picking.			Total	Lbs. Seed Cotton per Acre.	Per Cent. Lint.	Length of Staple.	Pounds of Lint Cotton.	Pounds of Seed per Acre.	Total value per Acre.
	Sept. 25	Oct. 14	Nov. 15							
1. Dixie	26	44.5	43.5	114	1396	32	7-8	447	949	$68.88
2. Brandon	27.5	37.5	45.5	110.5	1353	37	1	500	853	76.39
3. Allen's Multiplier	31	34	39.5	104.5	1280	33	5-8	422	858	64.96
4. Dodd's Prolific	37	45	46.5	128.5	1574	31	1	488	1086	77.62
5. Truitt's 90-Day	32	39	49.5	120.5	1476	33	3-4	487	989	75.05
6. Simpkins	38	40	39	117	1433	35	7-8	502	931	76.89
7. Trice	49	50.5	51	150.5	1843	31	1	571	1272	90.86
8. Rublee	41	42.5	47.5	131	1604	34	3-4	545	1059	83.39
9. Ashcraft	31	45	43	119	1457	33	1	481	976	75.93
10. Half and Half	40	40	46	126	1512	39	3-4	590	922	87.43
11. Cook from Cook	45	44.5	46.5	136	1666	38	7-8	633	1033	95.20
12. Cook from Station	35.5	41	43.5	120	1470	38	1-2	558	912	83.19
13. Wannamaker-Cleveland	47	47.5	53.5	148	1813	37	7-8	671	1142	101.50
14. Cleveland Big Boll	40.5	46	44.5	131	1604	35	1	561	1043	86.66
15. Triumph	39	41	46.5	126.5	1549	38	1 1-16	588	961	89.92
16. Uncle Sam	43.5	41	47	131.5	1610	35	1 1-16	563	1047	87.67
17. Rowden	45.5	45	55	145.5	1782	34	1 1-16	606	1176	94.00
18. Calhoun	41	45	50	136	1666	33	1 1-16	550	1116	86.82
19. Lone Star	36.5	42	47.5	126	1543	35	1 1-16	540	1003	84.08
20. Express	44.5	48.5	47.5	140.5	1721	29	1 3-16	499	1222	90.12
21. Allen's Unknown	40	41.5	46	127.5	1562	31	1 3-16	484	1078	84.86
22. Durango	35	43	36.5	114.5	1403	32	1 3-16	440	954	78.14
23. Columbia	29	37.5	29	95.5	1169	31	1 1-4	362	807	65.73
24. Foster (Delta Station)	40	45	44	129	1580	31	1 3-16	490	1090	85.88
25. Sunflower	34	40	32.5	106.5	1304	27	1 3-8	352	952	71.74
26. Haaga No. 2	39	38	34	111	1360	28	1 3-8	371	989	75.43
27. Dodd's Prolific	43.5	46	43.5	133	1629	30	1 1-8	488	1141	82.58
28. Foster (Haaga)	46	42	43.5	131.5	1609	31	1 5-16	499	1110	93.71

Remarks.—Planting early, with normal seasons. The difference in the quality of the seed could affect results materially. All bolls that set, even on the late varieties, matured. In a few instances the very best stand was not secured.

Values on cotton of different staples at Aberdeen, Miss. Based on market of October 16, New York futures for January closing at 12.05 on that date. All values based on strict middling grade.

3-4 inch, 12 7-8 cts.; 7-8 inch, 13 cts.; 1 inch, 13 1-8 cts.; full inch to 1 1-16, 13 1-4 cts.; full 1 1-16 to 1 1-8, 13 1-8 cts.; full 1 1-8 to 1 3-16, 14 cts.; 1 3-16, 14 3-4 cts.; 1 3-16 full, 15 cts.; 1 1-4, 15 3-8 cts.; 1 1-4 full, 15 3-4 cts.; 1 5-16, 16 cts.; 1 3-8, 17 cts.

FERTILIZER TEST WITH COTTON.

Date of Planting.—May 10, 1913.

Soil.—Very poor red clay hill land.

Plats.—1/20 acre each.

Variety.—Trice.

Number.	Yield of seed cotton.	Number.	Yield of seed cotton.
1. 200 lbs. Acid phosphate	430 lbs.	5. No fertilizer	360 lbs.
2. 200 lbs Basic slag	520 lbs.	6. 400 lbs. Acid phosphate	390 lbs.
3. No fertilizer	370 lbs.	7. 400 lbs. Basic slag	540 lbs.

4. 400 lbs. Untreated ground phosphate rock ..... 480 lbs.

This plat (4) extends length of both sets of plats, as indicated here.

Remarks.—The basic slag contains about 50 per cent of free lime and from 15 to 17 per cent of phosphorus. It would appear that this slag has given the best results. There is no question but these soils are deficient in both lime and phosphorus.

EIGHT YEARS' RESULTS WITH FERTILIZERS UNDER COTTON

YIELD OF SEED COTTON PER ACRE.

200 Pounds Fertilizer per Acre.

FERTILIZERS.	1906	1907	1908	1909	1910	1911	1912	1913	Eight years average
1. No fertilizer	520	860	820	310	300	400	300	200	464
2. 200 lbs. Cottonseed meal	680	1140	1240	615	900	885	600	530	824
3. 200 lbs. Acid phosphate	1180	1200	1420	690	1060	1020	670	760	1000
4. 200 lbs. Kainit	520	940	890	460	470	600	460	330	584
5. No Fertilizer	560	860	790	365	290	480	320	230	487
100 lbs. Cottonseed meal 6. 100 lbs. Acid phosphate	980	1140	1240	615	1160	985	730	730	948
100 lbs. Cottonseed meal 7. 100 lbs. Kainit	640	880	1000	550	800	760	620	460	714
100 lbs. Acid phosphate 8. 100 lbs. Kainit	960	980	1100	625	910	845	700	580	838
120 lbs. Acid phosphate 40 lbs. Cottonseed meal 9. 40 lbs. Kainit	1040	1030	1230	670	800	680	680	630	843
10. No fertilizer	600	760	820	340	250	500	230	240	468
150 lbs. Cottonseed meal 11. 50 lbs. Acid phosphate	940	900	1120	580	820	720	510	640	779
100 lbs. Cottonseed meal 12. 100 lbs. Acid phosphate	940	820	1190	630	810	760	580	660	799
50 lbs. Cottonseed meal 13. 150 lbs. Acid phosphate	800	1120	1210	660	800	620	620	580	801
14. No fertilizer	660	690	910	330	340	400	320	200	481

EIGHT YEARS' RESULTS WITH FERTILIZERS UNDER COTTON

YIELD OF SEED COTTON PER ACRE.

400 Pounds Fertilizer per Acre.

FERTILIZER.	1906	1907	1908	1909	1910	1911	1912	1913	Eight years average
1½. No fertilizer	420	580	560	260					455
2½. 400 lbs. Cottonseed meal	780	780	920	470					736
3½. 400 lbs. Acid phosphate	850	940	1070	425					821
4½. 400 lbs. Kainit	420	780	790	400					598
5½. No fertilizer	540	800	650	230					555
6½. 200 lbs. Cottonseed meal 200 lbs. Acid phosphate	1120	1160	1540	910	1186	1245	880	520	1070
7½ 200 lbs. Cottonseed meal 200 lbs. Kainit	760	1080	1180	660	830	1000	730	620	858
8½. 200 lbs. Acid phosphate 200 lbs. Kainit	1180	1200	1460	700	1030	945	750	730	999
9½. 240 lbs. Acid phosphate 80 lbs. Cottonseed meal 80 lbs. Kainit	1218	1270	1570	840	1050	1025	780	610	1045
10½. No fertilizer	520	850	920	250	200	340	270	210	445
11½. 300 lbs. Cottonseed meal 100 lbs. Acid phosphate	1040	1170	1650	850	940	1000	820	1000	1059
12½. 200 lbs. Cottonseed meal 200 lbs. Acid phosphate	1040	1180	1680	830	1000	1030	700	780	1030
13½. 100 lbs. Cottonseed meal 300 lbs. Acid phosphate	760	1060	1080	600	670	850	500	560	760
14½. No fertilizer	700			430	450	340	380	280	430

All of these plats were located in the field as indicated in this table. Only a six foot space between the two sets of plats.

Remarks.—All of the fertilizer plats planted to cotton in 1913 were planted about as early as weather will permit in this latitude. The growth was somewhat retarded early in the season on account of cool, wet weather. Taking the season as a whole it may be considered as normal.

Conclusions.—The use of both nitrogen and phosphorus, either alone or in combination, has given very satisfactory results.

Phosphorus hastens maturity. Valley land that is slow in maturing a crop can be very greatly benefitted by its use.

The use of potash, either alone or in combination with other elements, appears to be unnecessary in these soils.

On thin uplands, the use of an equal mixture of acid phosphate and cotton seed meal, at the rate of 200 pounds to 300 pounds per acre, gives very satisfactory results, and has done so for the past eight years. Two hundred pounds of this mixture has increased the yield of seed cotton in many instances over 500 pounds per year. On the more fertile soils the quantity of phosphorus may be increased to advantage.

Acid phosphate alone, 200 pounds to 300 pounds per acre, can be used to profit after leguminous crops.

The use of 300 to 400 pounds of rock floats will give good results where leguminous crops are to be grown. No legume will make satisfactory growth on the thin uplands of this section without the use of about 2 tons of crushed or ground limestone per acre.

Where rock floats are mixed with manure, or with compost, the phosphorus is made available for plant use.

FERTILIZER AND LIME TEST WITH COWPEAS.

Soil.—Table land, brown loam in texture.

Plats.—1/20 acre each, consisting of four rows. One half of each plat was cut for hay; on the other half the peas were picked.

Variety.—Mixed Whippoorwill and Clay peas.

Planted.—June 7, 1913.

Fertilizer per Acre.	Yield of hay per acre.	Yield of peas per acre.
1. No fertilizer	2400 lbs.	16 bushels.
2. 500 lbs. Air slaked lime in drill	3360 lbs.	23 bushels.
3. 200 lbs. Basic slag	3000 lbs.	23 bushels.
4. 200 lbs. Rock floats	3600 lbs.	20 bushels.
5. 200 lbs. Acid phosphate	3800 lbs.	24 bushels.
6. No fertilizer	2700 lbs.	20 bushels.
7. 500 lbs. Crushed limestone	4080 lbs.	25.5 bushels.
8. 2000 lbs. Air slaked lime broadcast	4360 lbs.	25 bushels.

Conclusions.—Lime and phosphorus are both very beneficial.

Remarks.—Continued rains at hay harvest affected results to some extent.

One application of lime, at the rate of 2 tons of crushed stone or 1 ton of air slaked lime per acre, will increase the yield of most legumes each year for several years. Lime will give better results when used under leguminous crops; however, on these soils, almost any crop will respond to the use of lime. Ten tons of lime per acre for the contents of the first seven inches of a soil is considered the minimum amount of lime for a maximum crop production, whereas these soils contain only about 4500 pounds. In 1912 at this Station, the yield of seed cotton was increased from 600 pounds on unlimed land to 820 pounds on soils that were limed, and the same year the yield of corn was increased 13 bushels per acre by the use of lime; that is, the unlimed soils produced 57 bushels and the limed soils in the same test produced 70 bushels per acre.

It should be understood that lime is not a fertilizer. Lime sweetens and tends to flocculate a soil and will give best results with leguminous crops, after which other crops are greatly benefitted.

We have adopted the practice of applying lime in the fall on land that has recently been turned and harrowing it in thoroughly so as to incorporate it with the soil. Such a method has proven satisfactory. Crushed limestone (dust from under a rock crusher)

cost delivered here $1.75 per ton. This limestone analyzed 67 per cent calcium carbonate. Limestone can be had along both the I. C. and Southern Railroads at about the price given above. Below is figure number 8 showing the results of the use of lime and no lime under soybeans.

FIG. 8.—EFFECT OF LIME UNDER SOYBEANS.

On the Left.—No lime was used.
On the Right.—Two tons of crushed limestone per acre was applied the fall before.

VARIETY TEST WITH SOYBEANS AND COWPEAS.

Soil.—Table land, brown loam in texture.

Plats.—1/20 acre each. One half of each variety was cut for hay; of the other half, seed were saved.

Date of Planting.—June 7, 1913.

Fertilizer Used.—500 pounds acid phosphate per acre.

Cowpeas.

1.	Unknown	4660# vines per acre	10. bushels peas
2.	New Era	3540# vines per acre	22.3 bushels peas
3.	Iron	3960# vines per acre	14.8 bushels peas
4.	Taylor	4340# vines per acre	21.7 bushels peas

5.	Red Ripper	4420# vines per acre	14.2 bushels peas
6.	Black	4540# vines per acre	14.2 bushels peas
7.	Large Black Eye	3260# vines per acre	17.1 bushels peas
8.	Ramshorn Ea. Black Eye	2448# vines per acre	18.2 bushels peas
9.	Brown Eyed White	3676# vines per acre	19.4 bushels peas
10.	Clay	4540# vines per acre	14. bushels peas
11.	Blue Whippoorwill	3908# vines per acre	24. bushels peas
12.	Brown Whippoorwill	3840# vines per acre	28.5 bushels peas
13.	Black Eyed White	3610# vines per acre	10.8 bushels peas
14.	Brabham	3604# vines per acre	29.1 bushels peas
15.	Groit	4084# vines per acre	26.8 bushels peas

Soybeans.

16.	Mammoth Yellow	3660# vines per acre	12.7 bushels beans
17.	Small Yellow	3340# vines per acre	14.0 bushels beans
18.	Black Soybean	2600# vines per acre	10. bushels beans
19.	Hollybrook Ea.	2800# vines per acre	9. bushels beans
20.	Brown Soybean	1960# vines per acre	14.7 bushels beans
21.	Ea. Dwf. Green	1580# vines per acre	7.3 bushels beans

Remarks.—Continued rains at hay harvest affected results to some extent.

Some of the varieties, such as the Unknown, Clay, Red Ripper, and Black pea, are late maturing varieties and did not mature all of their seed. Such varieties should be planted earlier for best results.

Soybeans.—Both the Mammoth and Small Yellow made excellent growth, attaining a height of four feet. A mistake was made in attempting to save the seed by the use of a threshing machine. As a result many of the seed were lost in curing the vines and in transit to the thresher. The results given above are much less than the actual yield.

STRAWBERRY GROWING.

Strawberries for market have proven a profitable crop in most instances. The berries are large, well colored, and of the finest quality. Soils that would not produce more than one-half bale of

cotton, under favorable conditions, have for the past six years produced an average of 68 bushels of merchantable berries per acre.

The following table gives data obtained:

Years	Acres.	Total crates.	Total sales.	Average per crate.	Number of crates per acre.	Total cost of crates and picking.	Net per acre.	Total net.
1908	5	571	$ 903.84	$1.80	114	$375.98	$105.57	$527.86
1909	5	418	883.75	2.11	83.6	331.44	110.46	552.32
1910	6	486	642.56	1.32	81	329.23	52.22	313.21
1911	8	856	1146.46	1.34	107	576.40	71.25	570.06
1912	6	432	531.92	1.23	72	299.44	38.72	232.48
1913	6	523	475.11	.90	87	339.95	22.53	135.16

The above table gives a net average for the first four years of $84.85 per acre, and for the last two seasons $30.63, or an average for the six years of $66.80. The average date of first picking for the first four years was April 22, and the seasons lasted an average of five and one-half weeks. The last two seasons the first pickings were two weeks later, and the seasons lasted less than two weeks.

The seasons for planting berries are October and November, and February and March. Early fall plantings will produce a light crop the next spring.

As berries are to occupy the same soil for at least three years, thorough preparation of the soil and a liberal use of manures will pay. Plant in 4 foot rows, slightly elevated, with plants about 18 inches apart in the row. By the end of the first season, with proper treatment, the rows should be covered 6 or 8 inches wide with plants. When spring plantings are made, cultivation should begin shortly after planting and be continued until early fall. The cultivation is the same as for any well cultivated crop. Probably the best results can be had with shallow cultivation as soon as possible after each rain. In this latitude no covering whatever is necessary in winter. Cultivation should not begin in the spring until after the berry season is over, but should begin as soon as possible after the season is ended. Bar with a turning plow 4 furrows to the row, reducing the tops of the rows to about 7 inches in width, and harrow down the middles at once. From 300 to 500 pounds of an equal mixture of cotton seed meal and acid phosphate per acre should be applied to both sides of the row in the bar furrow at this time, and the middles turned to the rows and harrowed. After this, cultivation should be frequent and shallow as given above.

The success attained in marketing berries grown here should be attributed to the fact that we have been able to ship almost altogether by freight and in iced cars. The past two seasons, we found it necessary to make some shipments by express, which necessitated the paying of a higher rate of transportation, thus reducing the profits.

Where conditions will allow, a few acres in Klondyke strawberries can be made profitable, if there are enough growers to load iced cars daily. The one crop system is as dangerous in berry growing as in any other one crop. Berries can be grown on almost any soil in the State, and every farm in the State can grow enough for home needs at least.

Below is a picture showing berry picking on the Station farm:

FIG. 9.—STRAWBERRY PICKING.

THE DAIRY.

A twenty-cow dairy was installed August 1, 1909, purely as a demonstration feature of Station work. An attempt has been made to run the dairy so as not to interfere with the regular Station work. The dairy cattle were secured, here and there, from various parts of the County and are mainly low grade Jerseys. A daily record has been kept of each cow in the herd. The first season seven cows were found unprofitable and were disposed of at about what they cost originally. Others were put in their places. The twenty-cow dairy barn was constructed strictly on sanitary principles, and under the partial supervision of a man furnished by the Dairy Division, U. S. Department of Agriculture. The barn is known in the Department as "Barn No. 12 A." It has concrete

floors and troughs, steel stalls and stanchions, and plenty of light and ventilation. The milk house is 200 feet from the barn and has concrete floors and walls with doors and windows properly screened.

Cost of Equipment.

Dairy barn complete	$ 875.00
Milk house	125.00
Twenty cows (4 years ago)	665.00
Steam turbine separator (900 lbs. milk capacity per hour)	125.00
Steam boiler (3 H. P. upright)	76.00
Milk tester, churn, butter print, cans, shipping jackets, wash sink, milking pails, etc.	142.00
Total	$2,008.00

One year later a 100 ton concrete silo, with gas engine, silage cutter, and corn harvester, was added at a cost of $ 800.00

The following table gives four years' results with the dairy, including the number of cows in the dairy each month and the amount of cash received monthly, as sales of dairy products:

Month.	1910		1911		1912		1913	
	Cows.	Sales.	Cows.	Sales.	Cows.	Sales	Cows.	Sales.
January	19	$ 168.23	16	$ 151.34	13	$ 74.55	19	$ 176.45
February	19	170.58	16	132.50	13	87.85	16	137.59
March	18	164.15	14	149.55	11	79.40	15	159.75
April	18	170.56	13	145.50	16	156.70	16	180.47
May	17	146.20	15	198.50	17	210.65	19	218.45
June	18	178.65	18	187.25	19	215.65	19	179.30
July	17	147.25	17	198.65	17	161.35	20	196.55
August	18	162.85	17	175.00	19	183.65	19	192.45
September	19	178.90	17	158.75	20	194.50	18	167.50
October	17	167.15	16	171.55	20	189.00	18	160.15
November	19	155.10	15	108.95	21	161.75	18	136.29
December	19	160.80	15	94.95	21	156.41	19	162.40
Total Sales		$1960.42		$1872.49		$1871.46		$2066.95

Average gross sale per cow for 1910, $108.31; for 1911, $119.26; for 1912, $108.80; for 1913, $113.60.

Dairy Product.—Almost the entire output of the dairy has been sold as sweet cream. Some whole milk has been sold at 20 cents per gallon. Some butter has been made each winter and sold at about 30 cents in the local market; this we avoided when possible. The cream was sold at 4 cents a butter fat point delivered, or 80 cents per gallon for 20 per cent cream, less express. The only delivery made is to express office. Almost the entire output has been sold in Birmingham, Ala., some 200 miles away. At the above prices it equals butter at 43 cents per pound, and that without the cost of churning, printing, etc. Only one shipment is made daily, which reaches its destination early the next morning.

Handling the Herd.—One negro man, full time, and two men at milking time, constitute the dairy force. The cows are pastured night and day for about seven months, or during the pasture season, and are held under a shed night and day for about five months, or during the winter season. All of the hays are fed under the shed; the silage and grain are fed in the dairy barn at milking time. The herd is kept bedded and has access to clean water. Weekly applications of rock floats adds greatly to the value of the manure. There is no night work connected with running the dairy.

Feed.—The dairy cattle are fed in winter on pea vines, soybean hay, peas and sorghum, oat straw, corn silage, cotton seed hulls, and cotton seed meal. The feeding is done on the basis of the following ration: 30 pounds corn silage, 10 pounds pea-vine hay, 5 pounds cotton seed hulls; and 4 pounds of cotton seed meal per day for each cow weighing about 800 pounds and giving about 22 pounds of milk per day. This ration is a little narrow. If one pound of cotton seed meal were removed and two pounds of corn and cob meal put in its place, we would have a better ration. Valuing corn silage at $3.00 per ton, pea hay at $12.00, cotton seed hulls at $10.00, and cotton seed meal at $28.00 per ton, the above rations cost 15 1-2 cents per day per cow. The summer ration used is about 2 pounds of cotton seed meal and 4 pounds of cotton seed hulls per day while on pasture. On the basis of the above rations the following is an estimated cost of maintaining a cow in the dairy for twelve months:

Winter feed, 150 days at $0.155 per day	$22.25
Summer or pasture feed, 210 days at $0.048 per day	10.08
Pasture rent 2.5 acres at $4.00 per acre	10.00
Ice and fuel used in handling product, per cow	5.00
Total	$47.33

If we allow the value of the manure to offset the cost of labor in running the dairy, each cow in the dairy has produced a net average for the four years of about $65.16. This does not take into account the skim milk fed to pigs and calves, nor the calves themselves.

Pasture.—The pasture is composed mainly of lespedeza and bermuda grass. White clover is now being added. Nine years ago the pasture land was badly gullied; today it is terraced and is supporting one cow to every two acres. Weeds and bushes are easily controlled by using the mowing machine once or twice a season.

Silage.—The best results in dairying or growing cattle of any kind cannot be had without silage as feed. At the present prices of hays, cotton seed hulls, and other feeds, there is no doubt that silage is very much cheaper than any of these. Land that will produce 30 bushels of corn per acre will usually produce 8 tons of silage. Corn silage can be grown and put in a silo for about $2.00 per ton, this is allowing rent for land and full cost of production. Mosby and Cocke's Prolific are both tall growing varieties of corn and fine for silage. Many crops can be used for silage. Indian corn is one of the most satisfactory.

The solid concrete silo at the Station has given most satisfactory results. No loss whatever has been sustained after the top was removed when feeding was begun. A coat of coal tar applied on the inside once every two years has prevented any damage in any way to the silo.

Remarks.—The dairy can be conducted without drudgery and without seriously interfering with other farm work. It furnishes a most satisfactory means of building up and maintaining farm fertility. It furnishes a home market for most of the farm crops, a good dairy cow paying the highest market price for feed. With cheap lands equally productive with any country, with long pasture seasons, short mild winters allowing the use of inexpensive barns, with the best markets in the South for dairy product, the opening is most flattering.

ALFALFA.

The report of the work done on alfalfa by this Station reached the public about one year ago as a circular, "Report of Work on Alfalfa at the Holly Springs Branch Station," and can be had for the asking. Here, we wish to discuss this subject very briefly, and more to induce farmers in the Brown Loam section to make a small planting, than for any other purpose. There is no doubt that it can be grown on almost any class of soil in this section.

The successful growing of alfalfa here may be summed up in the following: lime, fertility, inoculation, and fall planting. Lime should be applied the fall before at the rate of from 2 to 4 tons per acre, on land that was well broken for the purpose. This would be a fine time to add from 10 to 20 loads of manure per acre. Plant this land the next spring in some short lived crop such as cowpeas, potatoes, or beans; remove the crop early in July; turn the land very shallow and keep well harrowed until seed are sown. Plant 25 pounds of seed per acre, after rain, from the last of August to the middle of October, and harrow in. The seed bed should be firm. Three or four hundred pounds of soil from a well established alfalfa field will furnish sufficient inoculating material for one acre. Sow this soil on the land at seed planting and harrow in with the seed. You should get the first cutting of hay by the middle of May the next season, and this cutting should pay you for all expense you have had, except the manure.

Below is a picture showing hogs grazing May 1 on alfalfa that was planted the September before.

FIG. 11.—HOGS IN STATION ALFALFA.

LESPEDEZA, OR JAPAN CLOVER.

Lespedeza is one of the most valuable leguminous plants grown for pasture and forage in this section of the State. It adapts itself to almost any soil, sweet or acid, and from the poorest to the most productive that can be found. It will furnish, in season, as good grazing on the thin uplands, or produce as fine a quality of forage in the low valley lands, as any plant grown in the South.

While lespedeza responds to some extent to the use of lime, it is not benefitted anything like as much as most other leguminous plants. It responds readily to the use of phosphorus as a fertilizer. Below is a picture showing the results obtained from the use of 400 pounds of acid phosphate per acre. In this experiment the yield was more than doubled.

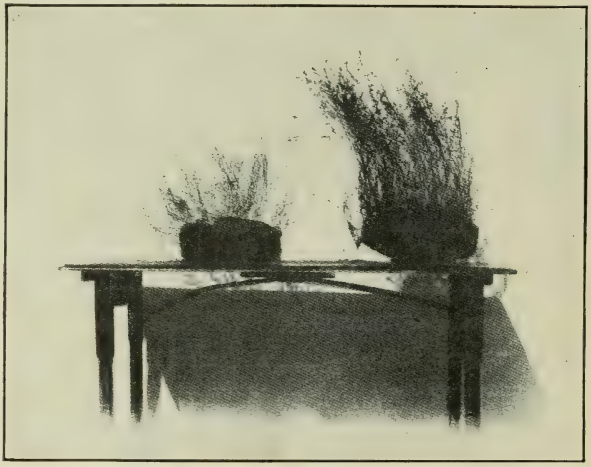

FIG. 12.—ACID PHOSPHATE UNDER LESPEDEZA.

The growth is slow in the spring, but as the season advances the growth is more rapid, and the lespedeza is ready for harvest as hay in early fall. On fertile soils it will produce from one to three tons per acre of very fine hay that is very easily cured. The plant is an annual, but if a few seed are allowed to mature before the plant is harvested, it will be perpetuated indefinitely. Where mowing is done early in the fall, the plant will in most instances make a sufficient growth after the mowing to reseed the land.

This plant should be used more extensively for hay in North Mississippi, but the soils should be prepared properly if the best results are expected. No plant responds quicker to good treatment than lespedeza. Every foot of uncultivated land, whether used for pasture or not, should be seeded to this plant, as it will add greatly to the fertility of the soil. No plant is more easily started than this, and live stock grazing on it when the seed are mature will scatter the seed in the manure that is dropped. The seed may be sown with oats of either fall or spring planting. After the oats are harvested, a fair cutting of hay can be had that fall. In this way this plant can be used in a system of rotation that will be most valuable to the soil. Some farmers in this section who grow considerable stock practice pasturing a piece of land two or

three years, and then putting it into cultivation, and putting the land that has been in cultivation into pasture. Where such a method is practiced, it is necessary to reseed this land for pasture. This reseeding may be accomplished by disking diagonally across the rows and running a section harrow at right angle to the disk and sowing the seed on top of the soil, or the seed may be sown on top of the ground without using the harrow. One bushel of seed (25 pounds) will seed an acre nicely, but very much less can be used with good results after the first year. Probably the best time to sow the seed is the latter part of February or early in March. Lespedeza grows nicely with bermuda and white clover, a combination that makes a most excellent pasture. The seed of this plant are very expensive, from $2.50 to $5.00 per bushel. Every farmer that cuts any lespedeza for hay should make an attachment for his mowing machine so the seed that shatter out in mowing may be saved. The seed thus saved can be easily cleaned sufficiently for home use. The yield of seed per acre is from 5 to 10 bushels, depending somewhat on the growth. The attachment shown in the figure below is very simple and inexpensive. The hay as it passes over the pan made of sheet iron that is attached to the upper side of the cutter-bar of the machine, shatters out a good per cent of the seed and these are caught in the pan.

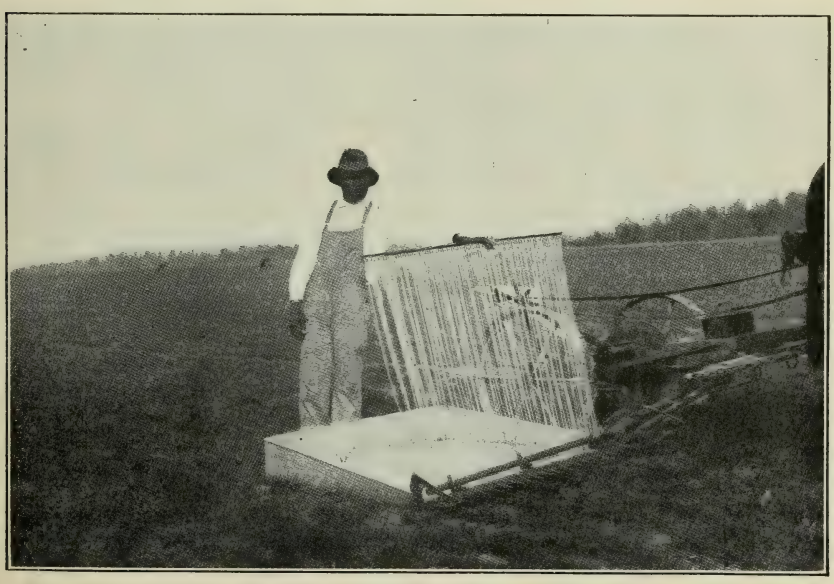

FIG. 13.—MOWER ATTACHMENT FOR SAVING LESPEDEZA SEED.

The above cut is from Farmers' Bulletin No. 441, published by Mr. W. B. Mercier, of the Department of Agriculture, Washington, D. C., and is shown here through the kindness of the publisher.

THE SWEET POTATO.

This is one of the most universally grown crops in the State, and it is constantly growing in popularity in the Northern markets. This Station has begun a variety test with the sweet potato, and is also trying out the different methods of keeping them until ready for use or for market. It is not our purpose to make a full report here, as we have not secured sufficient data, but to make only a partial report. The following method of growing plants and cultivating the crop has proven satisfactory so far. Bed only the finest selected medium size potatoes, as the best plants can be grown only in this way. Bed the latter part of March, in this latitude, in a hot bed heated with stable manure. Five or six inches of soil should be placed between the manure and the potatoes. Place the potatoes close together without touching, and cover about two and one-half inches deep with rich, loose soil. The bed should be covered with canvas. This is to be left off except during rainy or cold weather.

The soil used here was brown loam of medium fertility. The rows should be 3 1-2 feet apart, the soil being well prepared, and fertilized with 400 pounds per acre, of a mixture of equal parts of cotton seed meal and acid phosphate. The fertilizer should be put down about three inches deep in the row two or three weeks before planting. Set plants about 18 inches apart in the row. Cultivate shallow and frequently.

Early Triumph.—Has so far proven to be one of the earliest and most productive varieties, producing the past season 224 bushels per acre. It is a good eating potato, a good grower, and one of the best keepers.

Nancy Hall.—A yellow yam, short vine, very prolific, and a splendid eating potato. The yield the past season was 173 bushels per acre.

The two varieties named gave the best results of any used in the test and will meet the demand for both home and market use.

It is generally conceded by the best growers that the main points in keeping the sweet potato successfully, are to handle exceedingly carefully to prevent bruising and to get rid of the excessive water in the potato as soon as possible after the potatoes are dug. In many instances growers are very successful in placing them in well ventilated bins, in houses built for the purpose, and allowing them to dry out by a free circulation of air. Others are

successful in bedding as soon as dug, in dry road dust or dry sand. The old-fashioned bank is still in use. In this method 25 or 30 bushels are piled in a cone shape around a ventilator and after drying out are covered with soil to protect them from frost, boards being placed between the potatoes and the soil. There is a method of drying out the excessive water by artificial heat, which is recommended by the U. S. Department of Agriculture in Farmers' Bulletin No. 548. The potatoes are placed in well ventilated bins, and heat is applied by coal or oil stoves for three or four weeks, or until the potato is thoroughly dried.

This latter method gave fair success this past season. The potatoes in the upper bins kept perfectly, while those in the lower bins did not keep so well, which would indicate that the heat was not kept up long enough. The warm winter also had some effect. The thermometer was kept at about 85 degrees for twenty days. A full report of this work will be made when sufficient data have been obtained.

CRIMSON CLOVER.

In the fall of 1913 crimson clover was sown broadcast in corn early in September, and the seed covered by a shallow cultivation. Part of this soil had been limed four years prior to seed sowing, on the other no lime had been used. On the limed soil the clover made splendid growth from the start, and on the unlimed soil the plant made poor growth, showing the want of proper inoculation. On the unlimed soil a light application of stable manure was added broadcast. These plants became inoculated early in the spring of 1914, and but little, if any, difference could be observed between the plantings on either the limed or unlimed soils. Crimson clover is making splendid growth with fall sown oats. The soil where corn was removed for silage, was disked and seeded to crimson clover, and it is making splendid growth. On soil turned in the early fall and seeded to clover, it made very poor growth, and many of the plants died on account of the dry fall, as there was not enough rain to settle the soil firmly.

In this section almost any well drained soil that has been well cultivated in either cotton or corn or almost any other crop, can be seeded to crimson clover to great advantage in the early fall.

There is no reason why a crop of corn and a crop of crimson clover cannot be grown on the same land each season, with an increase in the yield of corn each year that such a method is prac-

ticed. The yield of clover hay will approximate from one to two tons per acre. The cost of seed per acre, from 12 to 15 pounds, is about $1.00, with not more than $.50 for planting. Crimson clover hay is as valuable as cowpea hay for feed. When we consider the small cost of the seed, the time and method of seeding, the fact that it grows during the winter as a cover crop, the fact that it adds nitrogen to the soil, and the fact that the value of the hay is from $15.00 to $30.00 per acre, we cannot doubt that crimson clover is one of the most valuable crops that can be grown on any farm. There are but few, if any, plants that will furnish as much grazing in the early spring as crimson clover provides. Try an acre that is well drained near the house; seed this acre after a rain from latter part of August to middle of October, the earlier the better. Where sown alone, 15 pounds of seed is enough; if sown with oats, half that quantity will be sufficient. To begin with, all plantings should be inoculated. This Station will, upon request ship one sack of inoculated soil to any man in this section of the State, free of charge, except the freight. A light application of stable manure will assist greatly in inoculation. After this acre has been properly inoculated, soil from this acre can be used to inoculate your entire planting. The U. S. Department of Agriculture at Washington can furnish a culture that is very satisfactory for inoculation.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

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Dairying on Cut-Over Pine Lands

By E. B. FERRIS.

AGRICULTURAL COLLEGE, MISSISSIPPI.
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*In co-operation with U. S. Department of Agriculture.

Dairying on Cut-Over Pine Lands

Introduction.—In many respects South Mississippi offers superior advantages for dairying on its cut-over lands, but there are also some very serious disadvantages. It has a very mild climate and expensive barns for housing cattle are not necessary, thus enabling one to keep the cattle constantly in the open air where they are freer from disease and where the manure from them may be dropped directly on the land where it is to be used. The sandy nature of the soils of this section makes it possible to pen cattle on them even in the wettest weather without injury to the land, and experience of this kind here has convinced us that the tramping of the cattle may actually make the physical condition of the soils better. Parking cattle directly on the soil where the manure is to be used has been tried here pretty thoroughly with both beef and dairy cattle and it has been conclusively demonstrated that the theoretical feeding and fertilizing values may be obtained from any feed used. As cotton seed meal is the cheapest and best feed that can be used here and as the feeding and fertilizing values of this meal are about equal, it is easily seen that the intelligent dairyman on these cut-over soils may get two values for all the cotton seed meal fed.

The cut-over lands generally are blessed with an abundant supply of pure water both above ground and underground. It is difficult to go a mile in any direction through this country without coming in reach of a spring or running stream of some kind, and surface wells may usually be had at depths not exceeding fifty feet. Overflowing artesian wells may be had in nearly all the river and creek bottoms, while deep wells are to be had anywhere. On an enclosure of one hundred and sixty acres at this Station there are four different branches that never go dry, being fed by innumerable springs. On the same enclosure a six inch well one hundred feet deep furnishes ten thousand gallons of water from five hours pumping without in any way exhausting the supply. The country generally has an unusually heavy rainfall, especially that part of it lying nearest the Gulf Coast, and frequent light showers keep the pastures green during summer and fall when often in other sections they are parched from drought. While the frequent summer showers serve to keep the pastures fresh and green, a part of our precipitation comes in the winter and early spring as veritable floods which do a great deal of harm by washing and leaching the soil.

The sandy nature of the soil here gives a freedom from the mud and filth that are serious handicaps to sanitary dairying in many other parts of the State. It also renders it possible to graze the cattle on winter cover crops for the greater portion of the time. Such crops as oats, vetch, and rape, when sown in the fall on improved soils, furnish excellent grazing for dairy cattle during the winter months and may be utilized for the greater portion of the time with no injury to the soil and little to the crops. Several of the clovers have also furnished good winter grazing here, especially after the lands have become inoculated and have been built up with the manure from well-fed dairy cattle. A systematic effort is being made at the McNeill Station to grow the several kinds of clover and also alfalfa, as winter grazing crops for dairy cattle. While we believe some of them may finally be grown profitably, they have so far proven far less reliable than oats, vetch, and rape.

Another very decided advantage that this section offers for dairying is the high priced markets on which our products may be sold. While this territory was once known as the "cow counties" of Mississippi, the dairy cow at no time has entered largely into the farm economy and dairy products have always been at a premium. Even now a very small part of the dairy products consumed in South Mississippi proper are produced here, being shipped in largely from other parts of the State and sections of the country. The country generally is close enough to such places as New Orleans, Mobile, and Gulfport for dairymen living near the railroads entering these places to market sweet milk or cream at prices twice as great as the average Northern farmer gets for his butter. A very large per cent of the population of South Mississippi is composed of people who work in saw mills and kindred industries, nearly all of whom buy their milk and butter from without the country, and even this trade would consume the product of a large number of dairy cattle. One has only to watch the sale of condensed milk in the local stores and commissaries and the crop of cans that accumulate around the back yards to realize the amount of money that annually leaves the country to pay for dairy products that might easily be grown at home.

The greatest handicaps to dairying in this section are a lack of people who have any ability or training to handle dairy cattle, the difficulty of getting dairy herds together that could be handled profitably anywhere; the high price of feed; and the extremely poor quality of grass that is furnished by the average range or pasture. The soils of this section are naturally extremely poor, being almost entirely deficient in phosphorus and very poorly sup-

plied with nitrogen, even though the lands are newly cleared. As a consequence, the grasses grown on them are not only small in quantity but also very poor in quality. Dairy cattle pastured on them will give almost no milk unless fed a highly nitrogenous ration in addition to the pasture. There is no way to overcome this deficiency of these soils in phosphorus except to supply it artificially with acid phosphate or raw phosphate rock. Nature, however, will quickly correct the deficiency in nitrogen if we will stop the annual fires and allow the great soil renovator, lespedeza, or Japan clover, to spread naturally over them. Twelve years ago when the McNeill Station was established, lespedeza was unknown to the people of this immediate neighborhood and one had to search diligently to find a sprig of it. Now, it grows well in all the pastures where fires are kept off and with small applications of raw phosphate rock to furnish phosphorus will soon give pastures rivaling those of the best grass lands of the State.

At best, however, these are not first-class grass lands; the lands cleared of pines frequently come up thickly to oak sprouts, which, if not removed, will choke out all grass; and numerous weeds make it necessary to mow the pastures frequently, a difficult operation if the land has not been freed of stumps. Even the best lands that have been set to bermuda grass and bur clover have to be mowed frequently in summer to keep down weeds.

The grasses grown on the ranges here will fatten cattle and we have frequently seen cattle that came through the winters as mere skeletons get fat enough for fair beef by May or June. While this is the case with beef animals, the dairy cow will give almost no milk under similar conditions unless fed cotton seed meal in addition. The native grass is largely of the sedge family, with an occasional patch of carpet grass where the seed have been introduced and conditions are favorable to its growth. The native grass quickly becomes coarse and stemmy. In this condition it is neither nutritious nor palatable and is annually burned off by the owners of cattle so that they may get the young tender sprouts in spring. Such pastures would hardly maintain more than one cow to eight or ten acres, but where the carpet grass is introduced will do very much better. Bermuda grass grows remarkably well on all these soils, particularly after they have been built up with the manure from dairy cattle grazed on them. On such land here, which is too rolling for cultivation, a field of two acres of bermuda grass has grown half knee high with thirty cows and calves penned on it every night and several horses during the day. In the winter time this same land grows bur clover that furnishes good grazing

during the latter part of winter and very early spring. Plowing up the bermuda in the fall and planting some winter crop like oats or the clovers will not destroy the stand, but the breaking of the turf only makes it grow the better during the following summer, when these crops are removed or grazed off by the cattle. Unless plowed up occasionally bermuda pastures here will run out and be replaced by other grasses or lespedeza, as the sandy nature of the soil causes the tramping of the cattle to kill out the grass.

Bermuda grass has been started here by planting the seed and by means of the stems. Uncleared lands have been taken and the most of the logs and tree tops removed, single turn plows used to break the land between and around the stumps, and these followed by harrows to smooth down the furrows. Three pounds of bermuda grass seed were then mixed with fifty pounds of cotton seed meal and sown over an acre of land and worked lightly into soil with a brush or light harrow. These seed require a long time to germinate and both times that the method was used here we despaired of getting them up, but were finally rewarded with enough plants to cover the land by midsummer. It is generally contended that bermuda grass will not mature seed in this latitude and doubtless most of the seed stems that it sends out in such large quantities do not develop seed, but an experience of twelve years with it here convinces us that a good many seed are matured and are finally scattered in manure and other ways. It is not a grass to be dreaded here, as it is in countries where stiffer lands prevail. The toughest sod here may be turned under easily with a two-horse plow in the fall and the following year will interfere very little with the cultivation of a crop like corn. One crop of velvet beans will shade it to death in a little while.

Hay Crops.—There are very few hay crops that have been successfully grown at McNeill with the exception of oats and cowpeas. Johnson grass and timothy have never been successfully grown; lespedeza and bermuda grass, while excellent for pastures, will grow high enough to cut only in exceptional cases; alfalfa has never been grown successfully here though repeatedly planted; it is doubtful if the clovers will prove profitable hay crops under average conditions; and while the velvet beans and soybeans grow to perfection, neither of them are well adapted to being saved as hay. Even if the country had a hay crop as pre-eminently suited to its soils as alfalfa is to certain parts of the West, we doubt if the growing of the same could be made profitable on account of the difficulty of saving dry forage in this section. Not only is the total annual rainfall of the section much heavier than that of the

northern and western parts of the State, but showers are much more frequent, particularly in the summer and early fall, and it is a very difficult matter to save dry forage at all in any quantity. Fall sown oats usually ripen in May, when conditions for saving hay are at their best, and it is usually possible to save a good quality of oat hay; so, too, peas planted in June after a crop of oats will be ready to cut after the middle of September when, ordinarily, weather conditions are favorable for saving hay. Even if planted as late as the middle of July, peas will have time to mature and will likely find better weather conditions for being saved as hay than those planted earlier. The saccharine and non-saccharine sorghums all do well here and will make an immense yield of coarse forage, but they are all very exhaustive to the land on which they grow, are stemmy and hard to dry out properly. While they will all make fair silage, we much prefer corn as a source of silage, and oats and cowpeas for hay.

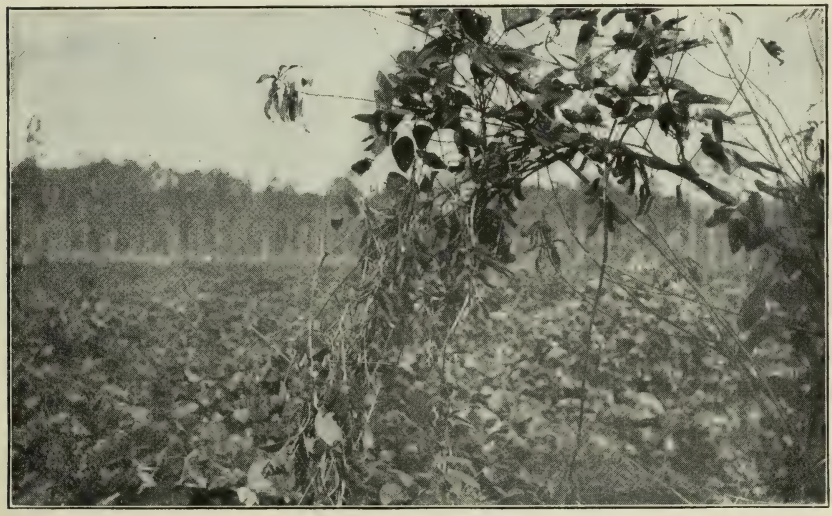
Japanese sugar cane grows to perfection all over the pine belt, is much more resistant to cold than the regular kinds of cane, and will occupy the land several years from a single planting of the cane. It makes an immense tonnage of a very succulent feed which may be used as silage or the stalks may be cut before frost and put in large piles, preferably under the drip of the roof to the barn nearest where it is to be fed. Rough walls should be built around this pile so as to keep the cane stalks together and straw or fodder should be packed around and over it to prevent freezing. The water from the roof falling on the butts of cane will prevent its drying out and the stalks will keep fresh through the winter. They may be fed to horses, hogs, or cattle either as the whole stalks, or, preferably, after it has been run through a shredder or corn cutter. Some have advocated the growing of this cane to be cut up and kiln dried and the writer has seen some very excellent dry forage made from it in this way, but does not know whether the drying can be done economically. The recently introduced Guinea, Sudan and Para grasses have been grown here with marked success, all yielding enormous quantities of rather coarse hay. These grasses and the sorghums and sugar cane could be used to great advantage as soiling crops to be cut green and fed to dairy cattle.

Corn is one of the most reliable crops that can be grown here, and on good land makes a large yield of grain and a very heavy growth of stalks, much heavier than corn making a similar yield of grain would make when grown farther north. Repeated efforts have been made to save these corn stalks as dry forage, but rains

are so frequent that it is almost impossible to dry the corn and shock it without its getting wet, and even when shocked in good shape the climate is so damp that the stalks and ears nearly always mold in the shock. Fully half the value of corn grown here is represented in the stalk. This makes it very important that these be saved in some way. The only way to get the full value of this corn crop here is to save it as silage, which can be done to perfection regardless of the frequent showers, which only serve to make it keep the better. So while silage is a valuable feed anywhere, it is doubly so here, where dry forage is so hard to save. In a country so full of saw mills as this is, silos should be as common as corn cribs, for the material to make them can be had at minimum cost and the government is maintaining a man in South Mississippi to furnish plans and superintend the building of silos, absolutely free to the people. A fifty ton silo can be built at a cost not exceeding seventy-five dollars and will house much more feed than a well constructed barn costing the same money, for in the silo the feed is packed so closely that air is practically excluded, whereas a good sized barn will soon be filled with the dry stalks from a very few acres of corn. Another great advantage of the silo in this country is that here the weevils destroy a large per cent of the corn stored, while the rats, too, get a goodly share, and both are entirely eliminated with the silo. Corn stalks saved as stover and well shredded will only be partially eaten by the cattle, whereas every shred of the silage will be greedily devoured. This Station has a stave silo which holds about forty-eight tons and cost about seventy-five dollars exclusive of the top, which is not necessary; a combination hand and power machine is used to cut up this silage and cost thirty-five dollars; a four horse power gasoline engine runs the cutter and pulls an improvised carrier which elevates the feed to the top of the silo; such an engine may be had from the department houses for less than one hundred dollars. We would, however, advise the use of an eight horse power engine with a slightly larger feed cutter and a blower instead of a carrier. There is absolutely no experiment about saving silage as so many of our people believe. Four successive crops have been saved here and have kept perfectly. Silage has been made here from peavines, several varieties of sorghum (saccharine and non-saccharine), soybeans, and Florida beggar weed. None of these make a silage comparable to that made from corn. Since corn does so well here, we can see no reason for wanting a substitute for it.

One of the most valuable feeds for dairy or beef cattle that can be grown in this country is the velvet bean. It is perfectly

adapted to conditions here, and may be grown on our poorest soils with little fertilizer, which cannot be said of the cowpea. It is best grown as a catch crop in corn, the stalks of which support the vines and cause them not only to fruit better but also to keep the beans off the ground so that they will remain in the field all winter without injury. When planted early enough to make a maximum crop of beans, they interfere some with the development of the corn, but chiefly with the gathering of it, as the vines completely envelop the stalks and ears, frequently pulling the ears to the ground, and so entwine themselves on stalks and other vines as to make it difficult to find the ears or to get through the vines to gather and haul out the corn. The most popular method of



VELVET BEANS.

growing these beans here is to lay off the field into three-foot rows, planting alternate rows to corn as early in March as possible, and about the first of May plant the rows left to beans. This difference in the time of planting will give the corn sufficient lead to complete the pollenization of the ears before the vines cover them and prevent this. A common practice here is to go through the fields just after the ears are dry and turn down the stalks just below the ear, which lessens the leverage of the bean vines and prevents their pulling many stalks flat on the ground. Instead of doing this, we gather the corn as soon as it is dry enough, and do not let it remain in the fields until frost. After frost falls on these vines, they quickly shrink up and interfere very little with the gathering of the corn, but weevils are so destructive here that corn

left so long in the field will frequently be badly damaged by them. A method used here also is to plant every row to corn and later to plant velvet beans about a foot apart in the corn drills. These beans do not grow off so rapidly, and interfere less with the development of the corn, but of course make fewer beans. When planted thus the corn shades the vines and they make no very great growth until after the corn leaves die when they grow off rapidly and will finally mature a good crop of beans. Grown by the two methods beans have been grazed off here by dairy cattle after frost and have been worth from eight to twelve dollars an acre as feed for these cattle. Even when grazed off by cattle they leave an immense quantity of vegetable matter on the land and will increase its productiveness faster than any other restorative crop.

Soybeans grow here perfectly, but are very stemmy and make a very coarse hay, the leaves of which shed badly and the stalks of which are not eaten by stock. These beans fruit abundantly and but for their tendency to pop open when ripe and the extreme uncertainty of the weather when they are ready to harvest, they might be profitably grown for the beans alone. The beans would readily take the place of cotton seed meal in a ration for dairy cattle, and with corn silage would enable the dairymen of this section to raise all their feed at home. These soybeans are the richest natural vegetable products known and approach cotton seed meal, a manufactured article, in their content of protein and fat. While the soybean makes a very dark and slimy silage when used alone, it can doubtless be mixed with corn when cut and put into the silo and make a good silage, the richness of which will be greatly increased by their use. We have never tested out this mixture, but feel sure it will prove a practical one with the proportion of two parts corn to one of soybeans. The soybean is very superior to the cowpea here in fruiting qualities. The latter seldom makes any peas of consequence except on newly cleared lands or when the seasons are exceptionally dry. Cowpeas do make a good growth of vines and when planted so as to mature in the late fall may nearly always be harvested in dry weather. Cowpeas do not grow anything like so well as a catch crop in corn as do the velvet beans, but where the corn is to be cut for silage the bean has to be discarded and cowpeas used.

A number of winter grains have been tested here as grazing crops for dairy cows during the winter. Nearly all varieties of oats, wheat, rye, and barley have given fairly good grazing during the winter, but all except the rust proof oats have succumbed to rust with the approach of hot weather. As the rust proof oats

furnish practically as good grazing as the others during the winter and will then make good yields of hay or grain in the spring, we, of course, recommend them over any of the above mentioned winter grains or cover crops.

Dwarf Essex rape has been repeatedly grown here as a winter grazing crop for hogs and cattle, and in our opinion surpasses all other crops for this purpose. It is a member of the cabbage family and like all of the members of this family requires a rich soil. On such a soil it makes a large quantity of succulent and nutritious feed of which the cattle are very fond. This rape has a tendency to give the milk of cattle fed on it a peculiar taste which to some people is not agreeable, but in grazing it here we have taken the precaution to turn the cattle on it in late afternoon just after they have been milked and have taken them off after two hours grazing and it has left no bad odor in the milk. Fed in this way rape has been worth here ten dollars an acre for the first grazing. When the cattle were removed until it sprouted out again from the same roots, it was then worth, perhaps, 50 per cent of the value of the first crop, though no accurate figures were kept the second time. This rape is an even better crop for hogs than for cattle and we have found it excellent feed for young calves. The seed are inexpensive, particularly when it is planted in drills, which we have found advisable on all except the richest land.

Mention has already been made of the scarcity in this section of crops suitable for hay and of the difficulty of saving the most of the ones that are suitable, due to our extremely wet weather. There is a crop practically indigenous to these soils that comes up as a volunteer on cultivated lands, and particularly in corn after it is laid by, that makes an excellent dry forage. It ripens at a time when the weather is usually dry and it can be saved to great advantage. This is the crop commonly known as Mexican clover, which, in fact, is not a true clover nor anything akin to it. It is a very valuable crop to the country and on good land will give a yield of two tons of excellent hay after a crop of corn. Its scientific name is "Richardsonia scabra." We do not know that the seed of this plant are regularly on the market, but they accumulate in considerable quantities in wagon bodies in which the hay is hauled and around places where it is being stacked, baled, or stored in the barn and may usually be had from farmers in this section.

Benefits of Dairying.—It is generally conceded that no agricultural country can economically maintain its native productiveness for long periods of time without the aid of live stock of some kind. This is due primarily to the fact that more plant food is

sold from the land where crops are sold directly than where they are sold through animals, and secondarily to the fact that proper systems of rotation, including the growth of restorative crops, cannot be carried on so economically without live stock as with them. This fact has not as yet been given serious attention by the farmers of Mississippi because the lands that have been in cultivation longest have been naturally so well supplied with plant food that the question of their losing this fertility has been largely disregarded. South Mississippi cut-over lands are, however, seriously deficient in plant food to begin with, and the owners of them will have to resort to every known means of building them up and of maintaining their productiveness. A good dairy cow is the most economical producer of digestible nutrients for the animal body of any form of live stock. In addition to this there is sold from the farm in butter or cream practically no plant food, which is left on the farm in the form of manure and skimmed milk, the last of which can be fed to the next most economical producer of human food, the young pig.

COW THAT GAVE FORTY POUNDS OF MILK PER DAY.

Dairy cattle give constant employment throughout the year to the entire household. This we mention as being a thing in their favor, but which a great many of our people look upon as being decidedly against them. With modern barns and milk rooms to be had here at a minimum cost dairying loses much of its drudgery,

because with concrete floors on which to milk and to work with the milk, and with a convenient supply of water with which to keep things clean, there is nothing to shock the most delicate sensibility in dairy work and it cannot be considered in any way more laborious than the average work of the farm. Concrete construction can be done in this country very cheaply, because supplies both of sand and of gravel are everywhere abundant. A proper water supply is a no more serious question than that of sinking a six inch pipe with a few feet of strainer on the bottom to a depth of one hundred feet or less in the ground. The same engine used for pumping this water may be used for running the silage cutter and blower, the grinding of the corn, or the turning of the churn and separator. Indeed, it may be used to wash the clothes and to furnish power for electric lighting in connection with storage batteries.

Dairying furnishes a steady income which may be accurately determined every day and if, perchance, it should not prove profitable, it can be known at once and one does not have to go a year or a series of years to find he is losing money. This is not often the case. There is less variation in income due to seasons and good or bad weather conditions with dairying than with any other form of agriculture, and it enables one to do business on a cash rather than on a credit basis. Dairy cattle furnish a market for nearly every thing grown on the farm and can be made to pay a better price for grains, hays, and forage crops than these would bring on the markets, besides leaving the fertility contained in them on the farm. They serve also as scavengers for cleaning out the fields of much that without them would be wasted and enable the farmer to grow and market many restorative crops, such as velvet beans and other legumes for which there is ordinarily no regular market. Dairying and trucking should always be carried on together, because they are naturally companion industries and the same advantages that contribute to the success of one have a like share in affecting the success of the other. A farmer with a number of dairy cows should at least have the satisfaction of knowing that his land is growing better instead of poorer each year and even if he merely breaks even with the sale of dairy products proper, the increase in his herd and the increased productiveness of his soils may amount to more than the net profits of other lines where crops are simply grown and sold directly from the soil.

As an example of what can be done here with dairy cattle, the McNeill Station four years ago began work with a few dairy cows. The first thing done was to get a water supply, which we did by

sinking a six inch pipe with forty-three feet of strainer on the bottom to a depth of one hundred feet. The water rose to within forty-three feet of the surface in this well and is pumped out and into a tank so elevated as to distribute it over the farm. This done, a thirty-cow barn with concrete troughs and floor and iron stalls and stanchions was built in connection with a commodious feed barn. Close by the two a fifty ton silo was built so that the feed from it could be fed without getting out of shelter. A separate milk room was built some distance from the barn. One room of this was built over the well and houses the engine, pump, and necessary belts and shaftings. This engine can be used to run the churn and separator at the same time that it does the pumping and is also made to cut up the silage, though it has to be moved for this.

An average of about eighteen cows have been milked since this work began and there has never been a day when we have had the least trouble in disposing of the product as milk or cream. The average sales from this herd winter and summer have been between $150.00 and $200.00 per month and at the same time we have raised the heifer calves and in the summer have had skim milk to feed to pigs. During the summer months the product of this herd has been sold as cream to ice cream manufacturers in either Laurel or Hattiesburg and during the winter time to milk companies in New Orleans. The price has been about four cents per point of butter fat in summer and five cents per point in winter, or, expressed in price per gallon for the milk as it came from the herd, about twenty cents in summer and twenty-five cents in winter. It has never been necessary to make any butter except from an occasional lot of milk that would sour.

These cows have been penned every night both winter and summer on paddocks near the barn so as to get the manure where it was wanted and it has had a wonderful effect in increasing the productiveness of these soils. The cows have been made to glean over all the different paddocks and fields as the crops have been removed from them and have in this way enabled us to convert into money a number of restorative crops like velvet beans, soybeans, cowpeas, beggar weed, and some winter legumes like vetch and several clovers. Some trucking has always been carried on here. There is always a part of every truck crop that it does not pay to ship. These cattle have consumed such of these as cabbage, snap beans, beets, and turnips, paying therefor a small price but much more than they would be worth as a fertilizer. These cows are made to eat up the cotton leaves, stalks, and faulty bolls when the

picking is over and thus obviate the necessity of pulling, piling and burning these to destroy the boll weevil. During the past winter these cattle grazed a field of oats and these with silage gave a better milk flow than we get in spring and summer.

Starting the Herd.—The most important point in dairying anywhere is the selection of good stock and so mating the cows with good bulls as to make each generation a little better than the one that preceded. The selection of good cows will be more difficult here than in regular dairy sections because the majority of native cattle have been bred on the ranges with no regard whatever to milking qualities. In selecting cattle for the Station dairy we found it best to go to North Mississippi, in a section where cattle had been bred for generations with a view to improving their milking capacity. It will be impossible for the average farmer or dairyman to buy pure bred cows to begin with and we would hardly think it advisable to do this anyway. These pure bred cattle are always much more expensive than grades and except for breeding purposes they are not one bit better, for the average high grade cow will stand more rough treatment than the registered animal and give practically as much milk and butter. With the experience and facilities necessary to handle registered animals, we would much prefer to own them and would always work with the aim in view of finally having only registered cattle, but it costs more to handle them, both in money and in care, and one would have to look to increased income largely from the growing of calves.

So far as calves are concerned the bull represents half the herd. If the cows are grades and the bull a pure bred animal descended from animals of pronounced breed characteristics, he will represent something more than one-half of the herd because of the greater power such well bred animals have of stamping their breed characteristics on their offspring. This being the case one can easily see the importance of getting none but the best bred bulls. There are several things to consider when selecting a bull of good dairy type. One is that he should have the conformation as an individual that characterizes the best animals of the breed; another most important thing is to know what the immediate ancestors of the animal in question have done as producers of milk and butter and particularly what his dam and paternal grandam have produced at the pail. The simple fact that an animal is registered or subject to registration means very little, for there are very many registered animals that are veritable scrubs so far as being producers is concerned and a bull calf from such animals is

worse than worthless. The best dairymen are coming more and more to keeping accurate records of the production of their herds and these records are frequently supervised and certified to by their experiment stations, so that it is easily possible now to get bull calves at reasonable prices that are out of cows whose records are known, sired by bulls of like good breeding.

The majority of bulls bought and sold are very young animals and we can only judge their future usefulness by the past performances of their sires and dams, but the surest way of selecting a first-class bull is to get an animal old enough to have sired heifers who have given milk and have themselves proven the worth of their sires. While old bulls are more likely to prove vicious than young ones, in all other respects they give better satisfaction, and to select an old bull with good daughters is the only absolutely sure way of getting what you want. If bulls are carefully handled, there is no reason why they should not remain useful as long as cows, but when allowed to run with the herd, they are apt to overwork themselves and become practically useless before they reach middle age.

Raising Calves.—The success of our efforts at dairying will depend more largely on the quality of the cows owned than on any one thing. While it is possible to buy some good cows, it is next to impossible to get a herd that will not have to be severely culled in order to get best results. Raising calves sired by good bulls and out of the best cows is the only way to get the most dependable milk stock. While this is both expensive and troublesome, we would advise every dairyman to do it. The calves must be raised apart from their dams and we prefer under ordinary circumstances to take them from the cows as soon as they are born and before they ever nurse at all, for in this way they learn to drink much more quickly from the bucket than when they are allowed to nurse their dams a few days. These young calves should be kept in a well ventilated shelter for a few days and should be fed on the mother's milk while it is still warm. Care should be taken to have the buckets out of which they are fed kept scrupulously clean and while it is preferable to feed the calves three times a day, we have always had good results from feeding them four to five pounds of milk twice a day at the regular time for milking the cows. The calf should have whole milk until it is past two weeks old when a little skim milk may be gradually added, bringing the calf to a purely skim milk diet when about four weeks old. As the whole milk is decreased and the skim milk increased, a substitute for the fat must be added. Corn meal is, perhaps, the best and cheapest

thing that can be used. About two tablespoonfuls should be added to each feed of skim milk and the feeding should be done while this milk is still warm.

In addition to the skim milk and corn meal the young calves should be taught early to eat a mixture of wheat bran and oats, and they should have the run of a good pasture and plenty of pure water. Grown in this way the calves should not cost over ten dollars at six months old and if from good parents should be worth much more than this to the owner. We do not think that it pays to raise male calves in this way, and usually kill them or give them away as soon as they are born.

Unless great care is taken to keep things clean around these young calves, scours will likely be introduced and give all sorts of trouble. We have found a Government publication issued by the Bureau of Animal Industry, U. S. Department of Agriculture, entitled, "Diseases of Cattle," almost indispensable here and would advise every dairyman to get one of these books by requesting it from his congressman or senator. It tells in simple language all about how to handle the common diseases of cows and calves, and gives remedies that the ordinary farmer can get and apply.

HERD OF DAIRY CATTLE.

Selection of Breed.—There is no one best breed of cattle for dairy purposes, just as there is no one best breed for beef purposes, nor one best breed of hogs, or sheep, or poultry. Conditions and surroundings usually determine the breed best suited to particular cases. We are of the opinion that it is nearly always best when

going into dairying to select a purely dairy type of cattle and not dual purpose animals. Dairy animals, of whatever breed, have been selected and bred for many generations back with a view of improving the one characteristic of producing milk or butter economically. It is natural to suppose that with equal ability on the part of the breeders, one quality could be more firmly fixed than two or more. There are several breeds of cattle distinguished alone for dairy performances, notably the Jerseys, Guernseys, Holsteins, and Ayrshires, also several other breeds little known in the United States and practically unknown in Mississippi. There is some characteristic of each breed that peculiarly fits it for certain purposes and conditions. The Holsteins, for instance, are very large cattle that give a big flow of milk rather poor in butter fat. They are peculiarly suited to sections of the country where the soils are rich and where milk is sold, rather than butter. The Jersey cattle are the smallest of the milk breeds but give the richest milk and would naturally be suited better to poorer soils where butter or cream is marketed rather than the milk as it comes from the cow. Really, the time is fast approaching when milk will no longer be sold by the gallon, but on its content of butter fat, and the volume of milk will then count for very little. Every pound of milk that has been sold from the dairy herd here during the four years we have kept cattle has been sold on a butter fat basis, the buyers having taken the milk from a number of herds, and after Pasteurizing have standardized the whole to meet the requirements of the market on which it was sold. Jerseys and Holsteins are the only purely milk breeds represented in any quantity in Mississippi. Of these two the Jerseys outnumber the Holsteins possibly one hundred to one, or more. On account of this fact we greatly prefer the Jersey, because it would be practically impossible to start a grade Holstein herd without going out of the State for cows. In South Mississippi, even if we chose to begin with native cattle as milkers, we would have trouble in getting Holstein bulls except from the North. These would not be acclimated and would very likely die of tick fever.

It is always best in breeding any kind of live stock, when once a certain breed is started, to continue it and not introduce other breeds. For instance, where we have Jerseys or grade Jerseys, it is best to continue the use of Jersey males rather than change to other kinds. Many people are of the impression that by mixing breeds we get the good qualities of both accentuated in the offspring, but experience has shown that we are just as apt, possibly a little more apt, to get the bad qualities intensified, particularly

in the later crosses. There are good and poor animals in every breed and the aim should be to select some one breed that has given satisfaction under the conditions to which they will be subjected. Then by the use of the best bulls of this breed and the selection of heifer calves from the best cows only, a herd of well selected and well bred individuals can be gradually built up. A good individual scrub cow is far better than a poor pure bred Jersey or Holstein, but the percentage of good animals among scrubs is far smaller than among the well bred animals and life is too short and time too dear for any dairyman or breeder to start with scrubs and attempt to build up a herd of good cattle entirely from them.

Selection of Good Animals.—There are a number of outward indications that serve to show the value of a cow for milk or butter production and the average dairyman knows these points, perhaps, without being able to point them out, or to say why he regards a certain animal as being a better producer than another. All such indications are valuable, but the surest and best way to tell a good dairy cow is to keep books against her and regularly weigh the milk she gives and occasionally determine the amount of fat in this milk by the Babcock test. To do this is quite a simple thing, adds practically nothing to the cost of production, and enables the dairyman at all times to know if his milkers are doing their duty or the cows theirs. By the use of uniform weight buckets and simple scales made for the purpose each cow's milk can be weighed and set down on a milk sheet just about as quickly as it could be poured into the can without the recording, and the dairyman who uses these scales for the first time will nearly always find that his profits are coming from a few of his best cows and that some of them are mere boarders and worse than worthless as dairy animals. The Federal and State governments are maintaining men in Mississippi at this time to travel from one dairy to another to help their owners inaugurate systems of accurate bookkeeping with their herds. These men will furnish free of charge milk sheets on which to keep the records and will even do all the additions and calculations at the end of each month and year, furnishing the owners with lists of their good and poor cows. Whether we avail ourselves of the government assistance or not, this is the only way to tell positively whether a cow is good, bad, or indifferent. It matters not how many of the best markings of a good dairy cow she may have, if the scales and milk tester show her deficient after a fair trial, she had best be discarded, for actual production is the final test.

The outward indications of a good milker are as follows:

1. The dairy cow may be likened to a machine used for taking in large quantities of rather coarse materials such as grasses and hays and converting them into products of less volume and higher value such as milk, cream, or butter. In order to do this well the best dairy cow should have the capacity for taking in this material, of chewing and digesting it well, and of converting as much of it to milk and as little of it to flesh as possible. The outward indications of this capacity are a large, wide mouth so as to gather the food quickly; long, strong jaws so as to masticate it thoroughly; and a large body that is long, wide, and deep for housing a capacious digestive system. The best milk cows will fatten but little when in full flow of milk, no matter how well they are fed, which shows that they are converting this feed into milk rather than into flesh.

2. The food when digested must be carried through the circulatory system into the heart, lungs, and udder, where it is finally converted into milk. In order to do this well, the animal must have well developed veins and arteries. This is indicated outwardly by the size and length of the milk veins that come out from the udder and run along the belly until they enter the body through the "milk wells." The size of these is said to indicate the ability of the cow.

3. A large lung capacity is necessary in the dairy cow to enable her to throw off the wastes of the blood and to take in the required oxygen for the body. This is indicated by large nostrils, a deep, wide chest and well sprung ribs to give room for lung expansion.

4. The size and shape of the udder is one of the best indications of the ability of the cow. The udder contains the glands which take the materials brought to them by the blood and convert them into milk. It should be wide and deep and extend well to the front and rear. It should be soft and pliable, and, when the milk is taken from it, it should be flabby. A fleshy udder indicates that glandular space is taken up by fat. The teats should be evenly placed, of fairly even size, and large enough to be grasped easily by the hand. The udder should not be cut up with grooves separating the quarters. The ease with which the milk may be taken from the udder is also an important consideration.

5. The production of milk is closely associated with nerve force, and the highly developed milk cow is quite the most nervous animal of our acquaintance. A strong nervous system is indicated by large, clear eyes, a broad forehead, and a long, straight back

with a long tail. A good dairy cow should have a strong nerve force but should exhibit as little nervousness as possible, though as a matter of fact the best of them will have the flow of milk seriously affected by excitement of any kind.

6. The value of a dairy cow is influenced by her ability to have good healthy calves and this is indicated by broad hips and well developed reproductive organs. She should be strongly feminine in appearance with well developed maternal organs.

With all these she should have quality and this is a thing hard to describe or indicate and is best judged of at a glance by the experienced dairyman. It is indicated by the glossy appearance of the hair and all other points combined.

Feeds for Dairy Cows.—Grass is, of course, the cheapest feed for any kind of live stock, but in no place and at no season can it be depended upon entirely for the best results with milk cows, particularly on the naturally poor soils of this section. In order to give best results every cow must have a properly balanced ration in which is furnished a definite number of pounds of digestible proteids, fats, and carbohydrates. The proteids are those substances in the feed which contain nitrogen and correspond roughly to the lean meat in human food. Protein is the most expensive part of the feed. It is usually furnished in this country by cotton seed meal and leguminous pasture or hay crops like alfalfa, lespedeza, velvet beans, soybeans, and cowpeas. These same crops also furnish carbohydrates and fats, but they are particularly rich in proteids and are especially good to balance up the natural pasture grasses and forage crops of this section. Protein enters very largely into the composition of the milk, blood, muscle, hair, and even the nerves, and more is required for dairy cows than for beef animals, though it is absolutely essential to both. It is due to a lack of protein in our range grasses that they prove so poor for producing milk, but will cause a cow to put on fat. A knowledge of this impresses upon us the importance of getting lespedeza started on all the pastures and ranges of this section.

The carbohydrates include the sugars, starches, gums, and fiber of feeds and form by far the largest part of all vegetable foods. The decomposition or burning of such substances in the animal body furnishes the greater part of the heat and energy that sustain the body. The carbohydrates are also converted into fat. The natural pasture grasses and forage crops of this section furnish carbohydrates in sufficient quantity to meet the needs of the animal body, but need to be supplemented, mainly with proteids, for milk production.

Fat includes the fat, wax, and green coloring matter of plants. It serves practically the same purposes in the animal body as do the carbohydrates, but has heating value estimated to be 2.25 times as great.

Balanced Ration.—It has been determined by numerous feeding trials that a milk cow weighing from 800 to 1000 pounds and giving between two and one-half and three gallons of milk per day will require about thirty pounds of dry matter in twenty-four hours, this to contain 2.5 pounds of digestible protein, 13 pounds of digestible carbohydrates, and one-half pound of digestible fat. This would give what is called a balanced ration and would be furnished by any one of the following combinations of feeds common to this section:

Ration 1.—Mexican clover hay, 15 pounds; cotton seed hulls, 15 pounds; cotton seed meal, 3 pounds; wheat bran, 4 pounds.

Ration 2.—Cowpea hay, 15 pounds; corn silage, 40 pounds; wheat bran, 5 pounds.

Ration 3.—Cotton seed hulls, 20 pounds; cotton seed meal, 4 pounds; wheat bran, 5 pounds.

Ration 4.—Cowpea hay, 10 pounds; cotton seed hulls, 15 pounds; cotton seed meal, 3 pounds.

Ration 5.—Cowpea hay, 15 pounds; corn stover, 10 pounds; cotton seed meal, 4 pounds; corn meal, 6 pounds.

Ration 6.—Sorghum hay, 20 pounds; cowpea hay, 10 pounds; cotton seed meal, 3 pounds.

Ration 7.—Crab grass hay, 15 pounds; cowpea hay, 12 pounds; cotton seed meal, 3.5 pounds.

The digestive organs of the cow are so made that a certain amount of bulk must be had with all feeds and it would not do to get the required amount of digestible nutrients in too small a volume, because in this event she would not be able to digest it. In this section there are very few days in the year when it would be necessary to feed all of any one of the above mentioned rations because the animals can usually get the most of the bulky feed (consisting largely of carbohydrates) from the pastures in summer and the gleanings of the fields in winter. When given the run of velvet bean fields here in winter, they will get almost a perfectly balanced feed from these alone, but this should usually be supplemented by about two pounds each of cotton seed meal and corn and cob meal.

During the spring, summer, and fall we usually find it best to feed here about four pounds each of cotton seed meal and corn and cob meal and as many cotton seed hulls as the cow will eat, in ad-

dition to pasture. For the rest of the year about four pounds of cotton seed meal and forty pounds of corn silage is necessary in addition to the gleanings from the fields and pastures and the grazing from such crops as oats, rape, vetch, and the clovers (the latter as yet having proven almost worthless). When the weather is too bad to permit of grazing or pasturing, they are given additional feed in the form of hay. To the extent that it can be used with safety, cotton seed meal is the cheapest feed that can be used here, but it is dangerous to feed it for considerable lengths of time in quantities greater than four pounds per day per cow. Bad effects from feeding greater quantities are manifested in frequent udder troubles as well as other ways, such as abortion and premature calving.

Results of feeding tests in this State have gone to show that one pound of cotton seed meal is equal in feeding value to two pounds of corn and cob meal, so that even at the highest price at which cotton seed meal sells, it still remains the cheapest feed that can be used. Cotton seed meal has a fertilizing value as great as its feeding value and other tests that were made in this State in which the writer assisted as an analytical chemist have gone to show that from 75 to 90 per cent of the fertilizing value of cotton seed meal fed to cattle can be recovered in the manure, the animals retaining only a very small per cent of the nitrogen, phosphorus, and potassium for use in producing bone, flesh, or milk.

One of the first tests made at the McNeill Station was to determine what part of the theoretical value of the plant food left in the manure could be actually recovered in the shape of crops. Thirty steers were fed here in the winter of 1902-03 over five acres of land on cotton seed meal and hulls and the troughs were frequently moved so as to cause them to distribute the manure evenly over the surface of the field. The ground was broken several times during the one hundred-day feeding period so as to prevent the manure washing off over the surface. For ten years after this records were kept of the increased yields of corn and cotton grown on this land over the same crops treated in the same way and grown on the natural soil. These records go to show that we have recovered in this time from the manure left by these cattle as much as the cotton seed meal and hulls cost when they were fed.

The soils of this section are more responsive to commercial fertilizers than any other type of soils in the State, yet there seems to be something about the effectiveness of animal manures that commercial fertilizers cannot approach. Plats of land set side here years ago for permanent tests with commercial fertilizers have been

fertilized liberally for ten years, yet they have increased very little in crop producing power, but the same class of soils have received animal manures, particularly where dairy or beef cattle have been penned on them at night, have received benefits that show for years.

An experience of twelve years with these soils convinces the writer that only the exceptional man will succeed in farming here who does not handle live stock in some form, either horses, cattle, sheep, or hogs, as conditions demand or the tastes of the individual farmer may lead him to select. This statement is almost true anywhere, but is doubly true here, where, when we clear the land and get it into first-class physical condition, we have little natural fertility but simply a good place to convert cheap products like fertilizers, manures, and restorative crops into higher priced products such as fruits and vegetables, cotton and corn. These soils cannot be mined even for a few years and the farmer who succeeds on them will have to be a manufacturer from the start. As is the case with all manufacturing the more skill we put into the manufactured article the higher will be the profits. Not only is the manufacturing process extended when we convert our cotton seed products, corn, etc., into milk, butter, or cream, but considerable skill is added as well.

Dairying is certainly not a lazy man's job, for it means work every day and Sunday throughout the year. While continuous, the work is not hard, nor should it be uncleanly. If not now, the demands of the trade will soon compel the production of milk on strictly sanitary principles. When we comply with the regulations of the city boards of health, dairying will lose much of the filthiness that now makes it distasteful to persons of refined sensibilities. The general introduction of concrete construction has done more than any other one thing to make dairying cleanly. With concrete barns and milk houses, a convenient water supply so easily to be had here, and a soil that makes little mud even in the wettest weather, we can see no reason why dairying should be considered as other than a gentleman's job. If properly conducted here, it will at least enable us to be gentlemen enough to pay our debts, which in the good old days was one of the prime requisites for putting one in this class.

Mississippi Agricultural Experiment Station

BULLETIN No. 167.

Corn Silage Compared With Hulls For Fattening Steers

By E. R. LLOYD.
AGRICULTURAL COLLEGE, MISSISSIPPI

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*In co-operation with U. S. Department of Agriculture.

Corn Silage Compared With Hulls For Fattening Steers

INTRODUCTION.

The feeding trial reported in this bulletin was conducted during the winter of 1911-12. At that time there were few silos in Mississippi and the principal feed used to fatten cattle was cottonseed meal and hulls. As a rule, the steers raised in the State were of poor quality with Jersey blood predominating. Few steers were finished for market. The bulk of the cattle were grazed, during summer and fall and shipped to market off of grass in October and November. In the short period of three years there have been hundreds of silos built in the State, and silage has, to a great extent, taken the place of cottonseed hulls as a roughage for all kinds of cattle. The cattle tick has been eradicated in about half the State and in a few more years the entire State will be freed of this pest. Nearly every grade herd of beef cattle is now headed by good registered bulls of one of the beef breeds. The raising and feeding of beef cattle has in the past few years developed into a very important industry in the State.

OBJECT OF EXPERIMENT.

The purpose of this work was to obtain additional data on the comparative value of corn silage and cottonseed hulls as a roughage for finishing beef cattle; to compare the cost of gains of steers fed under close confinement with those allowed the run of a paddock; to determine the amount and value of the manure actually saved from steers fed under close confinement and those allowed the run of a paddock.

CATTLE USED AND METHOD OF FEEDING.

For this experiment 24 head of native Mississippi steers were purchased, ranging in age from 4 to 5 years. Most of the steers had one cross of Shorthorn, Hereford, or Angus blood. For convenience of feeding, all of the steers were dehorned in November just before going on feed. This is responsible, in a great measure, for the small gains made by all lots during the feeding period. All of the lots were put on feed December 1 and were fed 142 days. The 24 steers were divided into four lots of 6 each.

Lots 1 and 2 received the same feed throughout the experiment, and the only difference in the two lots was that lot 1 was confined under shelter in an enclosure, 20 x 20 feet, and lot 2 was fed under an open shelter with free access to a paddock containing one-fourth of an acre. The following ration was fed the two lots: cottonseed meal, Johnson-grass hay, corn silage.

Lots 3 and 4 received the same feed, with lot 3 confined under shelter and lot 4 fed under shelter with free access to paddock. The following ration was fed the two lots: cottonseed meal, Johnson-grass hay, cottonseed hulls.

All of the lots were fed twice each day, at 6 A. M. and 4 P. M., and had free access to water at all times.

HOW THE CATTLE WERE VALUED.

At the close of the experiment the steers were consigned to Stewart, Son and McCormack, National Stock Yards, Illinois. When the steers reached the stock yards, they were divided into lots just as they had been fed, and each lot was classed and valued by Mr. William Fletcher, head buyer for Armour and Company. The four lots were sold to Armour and Company and the Company very kindly furnished us with killing weights, etc.

The following financial statement should not be taken to represent the actual profits in feeding beef cattle from year to year, but rather the relative profit depending on kind and cost of cattle, feed, and local conditions. A study of the financial statement will reveal the fact that the profits made from feeding these steers were not the results of gains made on feed but of the increased selling price over the purchase price. It will be noted that the gains were small, but the selling price was about double the purchase price.

In the following statement, the manure from each lot was carefully weighed and credited to that lot. In the case of lots 2 and 4, which had the run of paddocks, only the manure dropped under shelter was taken into account, that dropped on the paddock not being considered. The value given the manure was determined by chemical analysis.

Lot 1.—Six steers confined under shelter.

Amount eaten	silage	25560 lbs. @	$ 3.00 per ton	$ 38.34
	hay	4260 lbs. @	10.00 per ton	21.30
	c. s. meal	5046 lbs. @	25.00 per ton	63.07

To cost of feed for 6 steers 142 days	$122.71
To purchase of 6 steers, wt. 6180 lbs. @ 4½c	278.10
To labor to feed 6 steers	15.63
To interest at 6% on purchase price for 7½ months	10.43
To freight, yardage, and commission	21.36
Total	$448.23
By sale of 6 steers, wt. 6522 lbs. @ 8c	$521.76
By 40784 lbs. manure @ $4.32 per ton	88.10
Total	$609.86
Profit on lot 1 (six steers)	$161.63
Profit per steer (manure included)	26.94
Profit per steer (manure not included)	12.25

Gain of lot	660 lbs.
Daily gain per steer	.77 lb.
Shrink in shipping	4.65%
Cost per 100 lbs. gain	$18.81
Per cent dressed beef	59.32

Lot 2.—Six steers allowed freedom of paddock.

Amount eaten	silage	25560 lbs. @	$ 3.00 per ton	$ 38.34
	hay	4260 lbs. @	10.00 per ton	21.30
	c. s. meal	5046 lbs. @	25.00 per ton	63.07

To cost of feed for 6 steers 142 days	$122.71
To purchase of 6 steers, wt. 6190 lbs. @ 4½c	278.55
To labor to feed 6 steers	15.63
To interest at 6% on purchase price for 7½ months	10.45
To freight, yardage, and commission	21.36
Total	$448.70
By sale of 6 steers, wt. 6799 lbs. @ 8c	$543.92
By 21063 lbs. manure @ $4.32 per ton	45.50
Total	$589.42
Profit on lot 2 (six steers)	$140.72
Profit per steer (manure included)	23.45
Profit per steer (manure not included)	15.87
Gain of lot	940 lbs.
Daily gain per steer	1.10 lbs.
Shrink in shipping	4.65%
Cost per 100 lbs. of gain	$11.12
Per cent dressed beef	59.32

Lot 3.—Six steers confined under shelter.

Amount eaten	hulls	17040 lbs. @	$ 6.00 per ton	$ 51.12
	hay	4260 lbs. @	10.00 per ton	21.30
	c. s. meal	5046 lbs. @	25.00 per ton	63.07

To cost of feed for 6 steers 142 days	$135.49
To purchase of 6 steers, wt. 6185 lbs. @ 4½c	278.35
To labor to feed 6 steers	15.63
To interest @ 6% on purchase price for 7½ months	10.43
To freight, yardage and commission	21.36
Total	$461.24
By sale of 6 steers, wt. 6762 lbs. @ 8½c	$574.77
By 44353 lbs. manure @ $3.41 per ton	75.40
Total	$650.17
Profit on lot 3 (six steers)	$188.93
Profit per steer (manure included)	31.49
Profit per steer (manure not included)	18.92
Gain of lot	965 lbs.
Daily gain per steer	1.13 lbs.
Shrink in shipping	5.42%
Cost per 100 lbs. gain	$14.06
Per cent dressed beef	59.01

Lot 4.—Six steers allowed freedom of paddock.

Amount eaten	hulls	17040 lbs. @ $ 6.00 per ton		$ 51.12
	hay	4260 lbs. @ 10.00 per ton		21.30
	c. s. meal	5046 lbs. @ 25.00 per ton		63.07
To cost of feed for 6 steers 142 days				$135.49
To purchase of 6 steers, wt. 6230 lbs. @ 4½c				280.35
To labor to feed 6 steers				15.63
To interest @ 6% on purchase price for 7½ months				10.43
To freight, yardage, and commission				21.36
Total				$463.26
By sale of 6 steers, wt. 7008 lbs. @ 8½c				$595.68
By 22281 lbs. manure @ $3.41 per ton				37.88
Total				$633.56
Profit on lot 4 (six steers)				$170.30
Profit per steer (manure included)				28.38
Profit per steer (manure not included)				22.07
Gain of lot			1180 lbs.	
Daily gain per steer			1.38 lbs.	
Shrink in shipping			5.42%	
Cost per 100 lbs. of gain			$14.06	
Per cent of dressed beef			59.01	

VALUE OF THE MANURE.

When the manure was being hauled out to spread on the land, samples were taken from the different lots for analysis. The manure from the silage and hull lots analyzed as follows:

	Manure from lots fed silage and meal.	Manure from lots fed hulls and meal.
Moisture	74.78%	78.50%
Nitrogen	0.69%	0.57%
Potash	0.76%	0.61%
Phosphoric Acid	0.63%	0.38%

The analyses show the manure from lots fed corn silage and cottonseed meal to be worth $4.32 per ton, and that from lots fed hulls and cottonseed meal to be worth $3.41 per ton. In the field tests with manure from the different lots, 10 tons per acre were applied broadcast, in every case. Where manure from the lots fed silage and cottonseed meal was applied to land on which corn was grown for silage, the increased yield from the manured plot over the check plot was 4.88 tons per acre. Where manure from lots fed hulls and cottonseed meal was applied, the increased yield from the manured plot over the check plot was 4.58 tons per acre. Where the corn was allowed to ripen and was harvested for grain, the increased yield from the manured plot over the check plot was 10.9 bushels per acre. Where cotton was the crop used, the increased yield from the manured plot over the check plot was 363 pounds of seed cotton per acre.

In addition to the four lots of steers containing one cross of beef blood, another lot of 24 grade Jersey steers, which contained apparently no blood of any of the strictly beef breeds, were selected and divided into two lots of 12 animals each. The steers were from 4 to 5 years old, and were dehorned just before going on feed. In this experiment, no account was taken of the manure produced. One lot received a ration of silage and cottonseed meal and the other lot, hulls and cottonseed meal. No hay was fed in either case.

FINANCIAL STATEMENT.

Lot 1.—Twelve steers.

Amount eaten	silage	65184 lbs. @ $ 3.00 per ton	$ 97.76
	c. s. meal	10092 lbs. @ 25.00 per ton	126.15

To cost of feed for 12 steers 142 days	$223.91
To purchase of 12 steers, wt. 12530 lbs. @ 4c	501.20
To labor to feed steers	31.25
To interest @ 6% on purchase price for 7½ months	18.75
To freight, yardage, and commission	42.72
Total	$817.83

By sale of 12 steers, wt. 13760 lbs. @ $7.55	$1038.88
Profit on lot 1 (12 steers)	221.05
Profit per steer	18.42

Gain of lot	1710 lbs.
Daily gain per steer	1 lb.
Shrink in shipping	3.23 %
Cost per 100 lbs. of gain	$13.14
Per cent of dressed beef	58.05

Lot 2.—Twelve steers.

Amount eaten	hulls	41688 lbs. @ $ 6.00 per ton	$125.00
	c. s. meal	10092 lbs. @ 25.00 per ton	126.15

To cost of feed for 12 steers for 142 days	$251.21
To purchase of 12 steers, wt. 12260 lbs. @ 4c	490.40
To labor to feed steers	31.25
To interest @ 6% on purchase price for 7½ months	18.38
To freight, yardage, and commission	42.72
Total	$833.96

By sale of 12 steers, wt. 13780 lbs. @ $7.75	$1067.95
Profit on lot 2 (12 steers)	233.99
Profit per steer	19.50

Gain of lot	2030 lbs.
Daily gain per steer	1.19 lbs.
Shrink in shipping	3.58%
Cost per 100 lbs. gain	$12.38
Per cent of dressed beef	58.40

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BACTERIOLOGICAL EFFECTS OF GREEN MANURES

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Bacteriological Effects of Green Manures

INTRODUCTION.

Since this Bulletin is to be introductory to a series of studies on soil bacteria and green manures which have been undertaken at this Station; it is well that we should give a brief preliminary discussion of these and related subjects.

There is in the surface soil numerous microscopic plants known as soil bacteria. Though they can not be seen with the unaided eye, they are of the greatest importance to the farmer. It is the soil bacteria that prepares the soluble food for the growing crop. They break down the organic matter of the soil and form the nitrates. The humic, carbonic and other acids produced by their growth aid largely in dissolving the minerals of the soil and in making them available as plant food.

The organic material in the soil is the food for the soil bacteria. It is the fuel from which they derive their energy and out of which they manufacture the food for the crops. Organic material must, therefore, be constantly and continuously added to the soil. Its source is the dead remains of plants and animals. Products from animal sources are on the market as blood meal, tankage, and other fertilizers. These products are expensive. The much cheaper source of nitrogen is from the dead plant tissues. These are obtained from crop residues, and green and stable manures. The crop residue is that part of the field's growth that remains after harvest. It consists of the roots, stubble, straw or stalks that remain or that are returned to the field to be turned under along with what weeds and other wild plants that have grown in the field.

By green manure is meant the use of any green crop which is grown and turned under as plant food for a succeeding crop. Legumes are used almost exclusively for this purpose.

The partially decayed remains of all these organic materials occurring in the soil form the humus, which gives to a soil the characteristic dark, rich color, and a lack of which is indicated by the whitish gray soils.

It is not unusual for Mississippi soils to be deficient in humus. With the intense bacterial activity due to an abundance of moisture and heat the humus is rapidly used.

The increase, maintenance and control of humus in the soil is of vital importance to every Mississippi farmer. These subjects will now be considered in some detail.

SOIL BACTERIA.

Bacteria are microscopic one-celled plants. They are too small to be seen with the eye except where many grow together in one place. It takes a high power microscope to see them individually. From 1,000 to 2,500 placed end to end are required to reach one inch. They are spherical or rod shaped; the rods may be either straight or curved.

Their relation and importance to the growing of farm crops have only been understood in recent years. We now know that without their help crops could not long be grown. If it were not for the decay and return to the soil of the dead plants and animals the surface of the earth would soon be clogged with their remains. This constant decay and formation of soluble plant food for the higher plants is continually going on by the tireless energy of these microscopic plants. The most important of these processes is the formation of soluble nitrates from the animal and plant residues. In this formation three distinct steps are recognized, viz.: the formation of ammonia, nitrites, and nitrates.

Kinds of Bacteria.—The formation of the substances named above are known to be brought about by three distinct groups of bacteria; and neither group can do the work of the other. The organisms that form nitrites can not act upon the protein substances of plants and animals; but must take the ammonia products formed by the organisms of fermentation and decay. Neither can these organisms go beyond the formation of nitrites. Nitrates are not formed when pure cultures of the nitrite organisms are added to the sterile ammonia products in the soil; but the addition of the nitrate organisms is necessary and when added will give in a short time the test for nitrates. It is thus seen that the division of labor is carried to a high degree among soil bacteria. Each having its special work to do; and their great efficiency is, no doubt, due to this specialization.

Ammonifying Organisms.—The organisms capable of producing ammonia out of plant and animal residues are called "ammonifying bacteria." There are a number of kinds of ammonifying bacteria. Some are aerobic, others are anaerobic; *i.e.*, some live best with abundance of oxygen as in well tilled fields, others live where oxygen is partially excluded, as in wet swamps and heavy clays. Some are much more efficient in the production of ammonia than others. In Marchal's experiments, the species employed showed marked differences in their ability to produce ammonia out of egg albumen. The following proportions of the protein nitrogen were converted into ammonia in twenty days:

B. mycoides	46 per cent.
B. vulgaris	36 per cent.
B. subtilis	23 per cent.
B. flourescent	16 per cent.

Not only is this variation noted between different species but marked differences have been noted between one strain and another of the same kind of bacteria.

Beside the class of ammonifying organisms mentioned above there is another special class of bacteria, known as urea bacteria, that transform urea and other like products into ammonium carbonate. These organisms play a most important part in connection with stable manure added to the soil. This chemical transformation is brought about by means of an enzyme, known as urease, which is formed by these organisms.

Nitrifying Organisms.—Nitrification as generally understood goes on in two steps by two distinct groups of organisms. The organisms oxidizing ammonia to nitrites, called the nitrite bacteria were named by Winogradski *Nitrosomonas* and *Nitrosococcus*. The organisms oxidizing nitrites to nitrates were named by the same author *Nitrobacter*. The history of the experimental researches that led to the discovery and the isolation of these organisms is intensely interesting; but the scope of this paper does not permit us to give it here.

Nitrogen Fixing Organisms.—Nitrogen fixing organisms are those that have the power of utilizing the free nitrogen of the atmosphere in their life processes. There are two classes of these organisms. One class lives free in the soil and the other beside living free in the soil has the power to enter the roots of the legumes and form nodules on them and within which the bacteria live symbiotically.

Non-Symbiotic Bacteria.—The non-symbiotic organisms are both aerobic and anaerobic. The aerobic or azotobacter group are the most important and are known to have the power to add considerable amounts of nitrogen to the culture media in flasks in which they are grown. Just what agricultural importance these organisms have is but little known. It is known, however, that some abandoned plots, not growing legumes, at the Rothamsted Experiment Station have shown an average annual gain of 25 pounds of nitrogen per acre, and that these organisms are abundant in this soil. Such gains have been noted in the United States at the New Jersey Experiment Station, where horse manure was added to a poor sandy soil. It is believed that these organisms are responsible for this increase in nitrogen; but what part they play in assisting crop production has not been conclusively shown by vegetative tests.

The Root Tubercle Organism.—The symbiotic nitrogen fixing organisms that produce root tubercles play an important part in agriculture. Their power, in association with legumes, to utilize the free nitrogen of the atmosphere was first shown by the experiments of Heilriegel and Wilfarth in 1886. These organisms in the soil and in culture media are thin rods; in the root nodules they take on various branched shapes. This branching is more or less characteristic for the legume in which they are found. The thin rods in the soil under proper conditions come in contact with the root hairs and penetrate these; then by means of filaments they grow toward the interior of the root branch. This stimulus causes the proliferation of the plant tissues of the root and along with the multiplication of the bacteria a tubercle is formed. There is no regularity in the arrangement of the tubercles on the roots, since the bacteria may enter them at different places and times.

Virulence.—It is known that the plant offers more or less resistance to the entrance of bacteria into their roots. The bacteria must be sufficiently vigorous to overcome this resistance. The young legume in soils finding only small quantities of combined nitrogen soon turns yellow from "nitrogen hunger." Thus weakened the nodule bacteria more easily penetrates the root hairs. On the other hand, some bac-

teria have more power than others to enter the roots of the legume. Under favorable conditions this virulence may be much increased also their power of fixing nitrogen.

From these considerations it appears, theoretically, at least, that light top dressings of nitrate on new fields of alfalfa will benefit the crop by excluding all but the most vigorous bacteria through the increasing of the resistance of the young alfalfa plants to such an extent as to exclude the non-virulent root tubercle bacteria.

HUMUS AND ITS USE IN A SOIL.

Humus consists of the partially decayed organic remains of plants and animals. It gives the dark color to a soil. To understand the function of humus in a soil it is necessary to bear in mind the relation of a soil to the crop. In the first place, the soil furnishes a home for the growing plant. A place to anchor it; it must be of such a nature that the roots can readily enter, grow, and push themselves easily through it. It must be moist and firm, but not soggy, hard nor compact; shifting sand can not well answer the purpose, neither can a clay hard pan nor a wet boggy marsh. It must contain the proper amount and kind of plant food, moisture and soil atmosphere. It must be a suitable home for soil bacteria, for here the bacteria manufacture the available plant foods for the growing crop. Here is made the soluble nitrates and the organic acids and humates which liberate and make available the phosphates, potash and other mineral plant foods.

The humus in many ways helps a soil to better perform these functions. It increases the water holding capacity, improves the tilth, prevents extremes in temperature, makes a home for the soil bacteria and is a store house for plant food.

Increase of Humus in a Soil.—Organic matter is most cheaply added through crop residues, and stable and green manures. No stalks, straw, leaves or other plant material should be burned; all these go to form humus and when turned under and properly managed can readily be digested by all our ordinary soils. It has been shown that the burning of cotton stalks to get rid of boll-weevil does not materially lessen the numbers of this pest for the next year; but destroys a large amount of organic material so much needed for good crop production. The cotton stalks, corn stalks, and other coarse material that would interfere with cultivation can be easily handled by cutting them in short lengths with a stalk cutter or disk-harrow before being turned.

With our lack of farm stock in Mississippi stable manure with crop residues are not sufficient to keep up the humus requirements of our soils. It is, therefore, necessary to grow special green manure crops for this purpose.

NITRIFICATION.

The vast practical importance of nitrification is evident when it is known that crops take practically all their nitrogen in the form of nitrates. Though it is known that plants can utilize ammonia as a source of nitrogen; they do not usually do this since the ammonia compounds are so readily changed to the nitrite and the nitrite to the

nitrate forms. It is thus known that the nitrate nitrogen which is so necessary to all growing crops is manufactured by soil organisms from the dead remains of plants and animals. The proper understanding of the nature of these organisms, their living conditions and life processes will aid the farmer in many ways to regulate the preparation, and the cultivation of the soil for his crops, as well as the time and manner of planting.

He must keep in mind that just as soon as the soil is broken in preparation for the crop, these organisms are busy preparing plant food for the young crop that is soon to occupy the ground. He must remember, also, that the soil is a living active thing; not the dead, lifeless clods that they seem. Though they can not be seen by the eye, the bacteria are there and must not be forgotten. Should the soil be left in large dry clods, the activity of the soil bacteria are much hindered and many of the organisms die. Should heavy rains form a thick crust, they will be insufficiently supplied with oxygen. Should the crop be planted immediately after breaking, time enough will not ensue for the preparation and accumulation of sufficient plant food to start the crop.

Conditions Necessary for Nitrification.—The following conditions for the best production of nitrates are requisite: 1. The presence of nitrifying organisms in necessary quantities; 2. The proper temperature and moisture; 3. The aeration to supply the necessary oxygen for oxidation; 4. A base to neutralize the acids as they are produced.

Sufficient Number of Nitrifying Organisms.—That a sufficient number of nitrifying organisms is necessary for nitrification is seen in the sickly nature of the crop grown over a spot where an old building has stood. The first year very poor or no crop can be grown. Such a spot is said to be "dead soil," very few soil organisms are found; when the proper organisms are supplied large crops are raised.

Temperature and Aeration.—The effect of a low temperature in checking the formation of nitrates is readily noted in young cotton turning yellow and it may shed part of its foliage through "nitrogen starvation" whenever a cold wet time chills the ground in the spring. The bright green color returns when the warm soil, aerated by plowing, restores the activity of the nitrifying organisms in the surface layer. King found in the top foot of soil when oats were turning yellow only 0.026 parts of nitrogen per million of dry soil, whereas in soil where the oats were green on the same date there was 0.255 parts of nitric nitrogen per million.

The effect of aeration upon nitrification is seen in all processes of cultivating the soil. Nitrification is an oxidation process, both the change from ammonia to nitrite and from nitrite to nitrate are brought about by the addition of oxygen. The oxygen supply is obtained from the soil atmosphere. Thus a soil with a hard crust from a beating rain; a wet, soggy soil, or a hard, cloddy soil preventing the free supply of soil atmosphere interferes with nitrification. Cultivation by increasing the supply of oxygen aids nitrification.

It is known that the production of nitrates takes place almost exclusively in the cultivated surface soil. The researches at Rothamsted,

England, show that drain gages situated at a depth of 40 inches and 60 inches respectively, yield no more nitrates in the drainage water than one at a depth of 20 inches; showing that nitrification goes on almost entirely at the surface.

Soil Acidity and Calcium Salts.—In the oxidation of ammonia to nitrite and of nitrite to nitrate, nitrous and nitric acids are formed. Beside these acids, carbon dioxide is generated in vast amounts in the life processes of most soil organisms and other organic acids are formed in the decomposition of carbohydrates, fats and proteins. Bacterial action goes on so rapidly in our southern soils with so much moisture and humidity, acids are formed very rapidly, and thus it often occurs that such soils are "sour." Soil bacteria become inactive and inefficient as the acidity increases. Thus if it were not for the presence of lime, magnesia, and other basic substances; an accumulation of acids would occur and hinder bacterial action. The addition of lime to correct this acidity thus becomes necessary.

The calcium salts formed by the action of these acids upon the lime are more or less soluble. In this manner enormous amounts of lime are annually carried to the ocean as bicarbonates, nitrates and sulphates. Thus soil organisms furnish shell fish and other marine life the necessary material for building their skeletons. Coral reefs are formed, also chalk cliffs, marl, and great limestone beds accumulate, islands are built, a new continent is made. In this manner calcium circulates in nature.

Uses of Lime.—Beside the correction of soil acidity and the beneficial effect to nodule and other bacteria, lime improves the tilth of a soil. It has the power of granulating the particles of a clay soil making it more porous; giving it more power to hold water; making it easier to cultivate; furnishing much more air space and thus provides better conditions for bacterial activity. Lime makes a sandy soil more compact by cementing the grains together and prevents the soil being blown about by the winds.

Lime makes available such mineral plant foods as potash and phosphoric acid. It also serves as a plant food; the chemical analysis of plants always show the presence of lime. Thus the chief uses of lime are: to correct soil acidity, to improve the tilth, to promote the growth of the soil bacteria, to make available mineral plant foods and to serve as a plant food.

Necessity for a Cover Crop.—The loss of soluble nitrates by leaching through heavy rains, especially when the land is not occupied by a crop may be very considerable. In the warm climate of our state, nitrification goes on at all times in the year. While it is slower during the winter months yet a considerable amount of nitrates are continually being formed by the bacteria. The use of a cover crop to use and thus fix this nitrogen as rapidly as the nitrate is formed is therefore necessary. The kind of cover crops and their use will be discussed under the general subject of green manures.

GREEN MANURES.

Elements over which the Farmer has no Control.—The atmosphere is the original source of 98½ per cent of the materials found in all green crops; the carbon, hydrogen, and oxygen are supplied in the form of water and carbonic acid gas. These substances in the humid climate in which we live, are furnished free of cost; the supply being largely beyond our control. To be sure it is necessary to conserve and control the water supply; but when this is done, we have an abundance of moisture for large crops.

Table 1 gives the annual precipitation for Mississippi and for three of the large corn producing states in the Union. In each of these states, three sections were selected, which it was thought would give practically an average rainfall for that state.

The average rainfall for Mississippi is thus seen to be almost double that of Kansas and 15 and 17 inches more per annum than that of the states of Illinois and Iowa. Thus Mississippi has the advantage of our three great corn producing states in the amount of moisture, temperature and long growing season; three very important factors in the growing of crops.

Elements that the Farmer Needs to Furnish.—The farmer needs to concern himself about a very small per cent of the plant's food—less than 1½ per cent; since the other 98½ per cent, as has been said, is beyond his control. Of the seven elements included in this 1½ per cent,

TABLE 1.—Average annual precipitation in Mississippi compared with three of the best corn growing States in the United States.

	MISSISSIPPI			ILLINOIS			IOWA			KANSAS		
DATE	Agricultural College.	Meridian.	Vicksburg.	Urbana.	Springfield.	Cairo.	Sibley.	Ames.	Burlington.	Agricultural College.	Wichita.	Colby.
1902	53.4	50.1	47.3	[3]32.8	36.7	33.1	29.1	45.8	51.6	44.3	38.7	22.1
1903	40.9	44.6	38.0	32.5	28.3	33.0	35.4	26.4	35.0	37.0	31.1	21.1
1904	36.0	40.9	41.6	29.8	30.6	32.0	25.2	25.6	35.8	34.1	31.1	23.8
1905	[2]63.2	59.4	60.5	29.6	29.5	39.5	37.5	29.0	38.9	33.7	34.5	16.9
1906	[2]49.3	64.9	51.8	34.3	35.5	46.9	37.2	27.2	37.5	35.6	31.0	19.6
1907	45.9	54.2	51.6	40.2	41.1	45.6	25.3	27.6	37.6	28.5	31.1	13.0
1908	46.7	49.9	49.3	33.3	29.7	38.5	40.7	[1]35.9	38.1	44.1	37.7	14.7
1909	59.9	57.9	52.5	37.8	42.5	43.1	32.1	37.2	40.8	43.5	30.6	17.9
1910	37.5	43.4	50.4	28.0	27.5	45.9	16.1	18.7	28.0	33.8	17.8	6.0
1911	57.5	52.5	56.1	32.3	40.8	30.1	27.4	35.5	46.8	28.5	36.9	10.6
Av'ge	49.0	51.8	49.9	34.0	34.2	38.7	30.6	30.9	39.0	36.3	32.0	16.6
Av'ge for State		50.2			35.7			33.5			28.3	

1. Ames, Iowa, report incomplete; Des Moines report substituted.
2. Agricultural College, Miss., report incomplete; Aberdeen report substituted.
3. Urbana, Ill., report incomplete; Tuscola report substituted.

only four,—nitrogen, phosphorus, potassium and calcium—need claim his attention, since the other three, iron, sulphur and magnesium are present in the soil in sufficient abundance for the largest crops.

Calcium, phosphorus and potassium can be added only through purchase, however, often there is present in our soils a sufficient amount of the last two elements if they are only made available. The use of stable and green manures help greatly in making these available. Some soils are deficient in phosphorus and potassium then they should be added through purchase.

Nitrogen which is by far the most expensive to purchase and is the element most lacking in the soils of our state, need not be purchased, since it can be had from the inexhaustible supply in the air we breathe. There is, in the atmosphere, over every acre of land about 35,000 tons of nitrogen. The soil atmosphere like the air around us is about four-fifths nitrogen. Nitrogen in this form can not be used by crops; but the nitrogen fixing bacteria have the power to use atmospheric nitrogen in their life processes, and together with the legumes can supply it to our soils.

Nitrogen is furnished to our crops indirectly through the organic nitrogen of the soil. The organic nitrogen is furnished to the soil through the return of any organic material. The best means available to the farmer for the increasing of nitrogen is the plowing under of leguminous green manures. Where it is convenient it will be more profitable to feed the legumes and return the fresh stable manure to the soil. In many parts of the state there is not sufficient farm stock; and in these cases turning legumes to secure nitrogen and humus is not only a necessity in securing the humus, but much more profitable than the purchase of nitrogen in any form.

Since early times it has been known that legumes add fertility to the soil and when grown in crop rotations, the grain crops are benefited. That these crops are benefited when grown together with the legumes is indicated by the rank growth and dark green color. This may be noticed when oats are grown with vetch, timothy with red clover, or corn with soybeans or cowpeas.

Amount of Nitrogen Taken from the Air.—From experimental data obtained by the University of Illinois Experiment Station, it was found that on an average plants take about one-third of their nitrogen from the soil and two-thirds from the air through the aid of the root tubercle bacteria. If one-third of the nitrogen remains in the roots and stubble and two-thirds is removed with the crop, which is approximately true; it is evident that the soil would neither lose nor gain in nitrogen.

Amount of Nitrogen in Tops and Roots.—From the results of the Delaware Agricultural Experiment Station it was found that about 6 per cent of the nitrogen is in the roots of cowpeas and soybeans; 11 per cent in vetch; 28 per cent in crimson clover; 32 per cent in red clover; and 42 per cent in alfalfa. The University of Illinois Agricultural Experiment Station finds the percentage of nitrogen in the roots of sweet clover to be 19 per cent of the total. It is seen, therefore, that leguminous crops with extensive root systems like alfalfa, red clover, crimson clover, and sweet clover may be removed and yet leave behind in the roots and stubble nitrogen equivalent to the amount taken from the

soil by these plants. Now if stable manure is added or an occasional crop of green manure is turned to compensate for the loss of nitrogen by leaching, the nitrogen in the soil will be maintained. When leguminous crops like cowpeas or soybeans are cut and removed there does not remain sufficient nitrogen in the roots to compensate for that taken from the soil by the crop so the land becomes poorer in nitrogen.

Soil Inoculation.—When the nodule bacteria are not present in a soil, they may be added by inoculating the seed with pure cultures of these organisms or by inoculating the seed or soil by use of well infected soil taken from a plot of ground where the legumes have been growing well and are known to contain an abundance of tubercles on their roots.

Pure cultures of these organisms can readily be obtained, by one trained in bacteriological work, by aseptically opening a tubercle from the root of the legume and smearing some of the nodular substance on a prepared agar jelly medium. The organisms in a day or two grow on this medium until they are plainly visible to the eye in a raised, watery, jelly mass.

The Soil Bacteriological Division of the Bureau of Plant Industry of the United States Department of Agriculture grow these cultures and distribute them free to the farmers. There are also a number of commercial firms that sell them at a very nominal price.

The advantage claimed for the use of pure cultures are: 1. The organisms are more virulent. 2. There is no danger in distributing noxious weed seed as may be done in soil inoculation.

In practice many failures have followed the use of pure cultures. The cultures die readily and are easily contaminated and then killed by the overgrowth of other bacteria and moulds. Their application must be made with much more care than with infected soil. However, use of pure cultures is at present proving to be much more successful than formerly; this is because of the better prepared cultures, with more careful directions, and the farmers have followed directions in more detail.

The inoculation with soil may be done by making an emulsion with well infected soil, and when the soil settles, sprinkle the seed or the dry soil with this emulsion and thoroughly mix; sow broadcast or with seed drill. Where the infected soil can be had in abundance near the field to be inoculated, the more usual way is to spread this soil over the plowed field at a rate of from 200 pounds to a ton per acre. The better time to apply, whatever method used, is on a cloudy day when the soil is moist and harrow in well. Sunshine readily kills the bacteria; and they are also killed by drying. For this reason it is better to apply in the afternoon.

The question is often asked whether the organisms that produce tubercles on one legume will produce tubercles on another. It is known that the organisms producing nodules on sweet clover will produce nodules on alfalfa or bur clover; and that the organisms producing nodules on red clover will do so on alsike, white and crimson clover; in the same way common vetch and hairy vetch are associated and cowpea with partridge pea. The organisms are not interchangeable for alfalfa, red clover, cowpea, soybean or vetch. Only on the near related species of legumes do the organisms produce nodules interchangeably.

The organisms for the common clovers, cowpea and vetch are widely distributed throughout the South and rarely is inoculation necessary. For alfalfa and soybean it is often necessary to inoculate. Soil from ground where sweet clover, or bur clover as well as alfalfa grows with an abundance of nodules is satisfactory for the inoculation of alfalfa.

When no infected soil is available on the farm or in the neighborhood, it is advisable to plant only a small plot, say one-tenth acre, with great care, using pure culture or soil shipped in for inoculation.

How long the nodule bacteria live in the soil without the presence of a leguminous crop is not definitely known; probably in five or six years they will be so reduced in numbers that inoculation will be necessary, or at least helpful.

COVER CROP.

A cover crop or catch crop is one occupying the ground before or after the money-making crop or principal crop of the season; such as one following early potatoes, oats and vetch, corn or cotton. The uses of a cover crop are to protect the soil from the burning sun, and prevent the injury to the soil bacteria and the small rootlets of the crop in the surface soil; to utilize the soluble nitrates that would be lost by leaching and to add organic matter to the soil.

It is very necessary to increase the organic matter or humus in most of our Mississippi soils. Usually one feels that he can not afford to give up a season's growth for the improvement of the soil alone; so when this can be done with a catch crop occupying the ground during the part of the season after the money crop is harvested a saving of time is made and our soil is improved also.

Kind of Cover Crop.—The kind of a crop to use for a cover crop will depend upon circumstances; and only general advice can be given. There are two general kinds to consider the legumes and the non-legumes. Other things being equal the legume cover crop will be the better of the two; since the legume has the power, not possessed by the non-legume to use and thus to add to the soil nitrogen from the atmosphere. Circumstances may occur when non-legumes, like rye, rape, oats, or buckwheat may be better suited than a legume for a cover crop. The seed of these may be available, when that of the legumes are not. The soil, time of planting and the purpose for which the crop is to be used are all to be considered. It is far better to use a non-legume than to allow the soil to be unoccupied. The use of a non-legume holds the nitrogen that is present, adds organic matter, prevents the washing of the soil by the mass of roots present, and a mulch is formed protecting the soil and holding moisture.

The legumes well suited for catch crops are, cowpeas, soybeans, vetch, crimson clover, red clover, or bur clover. When these are to be used as green manures which is their most important use, the cowpea or soybean do well after corn: planting these at the last plowing of the corn. By late fall they have made an immense growth and will be ready by or before Christmas to plow under together with the stalks for the next cotton crop.

In turning them, the use of a stalk cutter to mash down the legume and to cut the corn stalks in short lengths will be very necessary. It

would be better to turn them while the legume is still green and full of sap. The bacteria will then act much more effectively on the green material and reduce the organic material more efficiently.

FIG. 1.—Cowpeas in Corn Seeded at Last Planting.

For cover crops after cotton the clovers or rye are better suited. These stand the tramping, necessary in the picking of cotton, and continue their growth through the winter and early spring. They may be turned in the spring and a silage crop of corn planted. The silage crop can be planted later than the cotton or a corn crop planted for grain. This gives time for the clover crop to get a good growth and makes a large amount of organic matter which can be turned sometime in April or May.

Drying Effect of Cover Crop.—The Mississippi farmer has little to fear from the danger of the drying effect in the use of green manures. In sections of the country where the average annual rainfall is less than thirty inches there is much danger that the green manure will use the moisture and leave the soil too dry to start the succeeding crop. Or there may be insufficient moisture in the soil when the green manure is turned to bring about the decomposition of the organic matter. This would result in a serious injury to the physical condition of the soil. With an average annual rainfall of more than 50 inches there is no danger from a lack of moisture for the cowpeas or soybeans which are turned in the winter and but little danger that any crop would suffer for this reason.

Kind of Legumes to Grow.—The kind of legumes to plant will depend upon the climate, the soil, and the use for which the crop is desired. A very large variety of legumes can be successfully grown in

Mississippi. Alfalfa grown in the limestone soils has no superior as a hay crop and soil builder. As many as five cuttings per season may be obtained giving ten tons of cured hay. Its extensive root system makes it one of the best soil builders among legumes. For catch crops and late summer crops cowpeas or soybeans are unexcelled. They may be planted after oats and vetch, a potato crop, or in corn at the last plowing. These may be hogged off or turned for green manure. For a winter crop hairy vetch with oats, crimson or bur clover are excellent. The oats and vetch make an abundance of excellent hay; the crimson clover or bur clover are splendid early pastures or to turn as green manure. In the southern part of the state the velvet bean makes an immense amount of forage and is highly prized. Lespedeza for its hardiness, and as a pasture is very highly recommended.

EXPERIMENTAL.

Purpose of the Work.—The general purpose of the soil bacteriological studies that are being carried out at this Experiment Station are: 1. To add something to the knowledge of Soil Bacteriology; and, 2. To arouse an interest in the farmers of Mississippi to largely extend the use of green manures as a means of increasing the fertility of their soils. The special object of this experiment was to determine the effect of micro-organisms in the fermentative destruction of a green manure and the advantage of adding a light dressing of stable manure, a bacterial culture, or both in the utilization of this green manure as a plant food.

Plan of the Work.—Two series of jars were arranged; one for the bacteriological tests, and the other cropped to oats in order to correlate the results of the bacteriological tests with the vegetative tests. Each series is done in duplicate.

Jars.—The three-gallon stone jars, were selected with care, so they all have practically the same height and diameter. The ones used for the series cropped to oats have a drain, those used for the bacteriological tests are not drained.

Soil.—The soil used in the jars was obtained from a tilled field on the Experiment Station Farm. It is poor in plant food and is a mixture of sandy silt and a sandy loam soil. An analysis showed it to contain only 648 pounds of total nitrogen per acre for the plowed stratum, 6 2-3 inches. The soil was put through a one-fourth inch mesh seive and thoroughly mixed before putting it in the jars. The water holding capacity of this soil was 23.7 per cent. The soil in the jars used for the bacteriological test was kept at a moisture content of 12 per cent by adding distilled water to weight from time to time. The jars cropped to oats were watered to maintain a good tilth. The scheme of the treatment is given in Table 7. Jars in Series I were cropped to oats; in Series II, were used for bacteriological tests.

Fertilizers.—The ground limestone used was furnished us from the Casper Stolle Quarry and Contracting Co., East St. Louis, Ill. The finely ground raw rock phosphate came from the Mt. Pleasant Fertilizing Co., Mt. Pleasant, Tenn. Limestone was used in all jars save the first four in each series at a rate of three tons per acre. (See

TABLE 7.—Treatment and arrangement of the jars.

No. of Jar Series 1.	No. of Jar Series 2.	(Treatment Same for both Series).
1 & 2	21 & 22	Nothing Added.
3 & 4	23 & 24	No lime & 2 T. Al.
5 & 6	25 & 26	3 T. G. L. & 2 T. Al.
7 & 8	27 & 28	3 T. G. L. & 4 T. Al.
9 & 10	29 & 30	3 T. G. L. & 4 T. Al. & 2 T. H. M.
11 & 12	31 & 32	3 T. G. L. & 4 T. Al. & 2 T. C. M.
13 & 14	33 & 34	3 T. G. L. & 4 T. Al. & 1 T. R. P. & 2 T. H. M.
15 & 16	35 & 36	3 T. G. L. & 4 T. Al. & Bacterial Culture.
17 & 18	37 & 38	3 T. G. L. & 4 T. Al. & 1 T. R. P. & B. Culture.
19 & 20	39 & 40	3 T. G. L. & 4 T. Al. & 1 T. R. P. & 2 T. H. M., and Bacterial Culture.

T. G. L.....Tons of ground limestone per acre.
T. Al.....Tons of alfalfa per acre.
T. R. P.....Tons of raw rock phosphate per acre.
T. H. M.....Tons of horse manure per acre.
T. C. M.....Tons of cow manure per acre.

Table 7.) The rock phosphate was used at the rate of one ton per acre. The limestone and the rock phosphate were intimately mixed with the soil on a sterile oil cloth and then returned to the jar. Horse manure and cow manure were used at the rate of two tons of the fresh manure per acre. Alfalfa was used as the green manure. It was collected from a patch that was beginning to bloom, cutting the stalks off close to the ground. No roots but stalks only were used. The moisture of the green alfalfa was determined, and the green alfalfa was added to all but the check jars at a rate equivalent to two and four tons of the dry weight per acre. The alfalfa and the stable manure were added at a depth of eight inches.

The bacterial culture was prepared by growning, on meat juice peptone agar, in four, six inch Petri dishes, from a seeding of an infusion, made from garden soil and horse manure. The Petri dishes were incubated for thirty-six hours at 30 deg. C. A very heavy growth was obtained. Sterile distilled water was added to the agar plates and the surface gently rubbed with a sterile bent glass rod in order to detach the bacteria. The emulsion from the four plates was placed in a flask and made up to 1,200 cc. and thoroughly shaken. One hundred cc. of this emulsion were poured over and mixed with the top soil in each of the twelve jars as indicated in Table 7.

Bacterial Tests.

Two kinds of bacteriological tests were made. A quantitative test made by determining the number of bacteria per cubic centimeter; and a physiological test made by determining the amount of ammonia produced with uniform samples of the different soils when seeded into equal amounts of a good ammonifying medium.

Quantitative Tests.—The quantitative tests are made by seeding on a specially prepared solid jelly medium uniform quantities of soil infusions. After trying out several of the different solid jelly media recommended for this purpose the following formulae recommended by Lipman and Brown was used:

1000 cc. distilled water.
0. 5 g. K_2HPO_4
0.2 g. $MgSO_4$
0. 05g. peptone.
10.0 g dextrose.
trace, $Fe_2(SO_4)_3$.
15 gs. Agar.

While this medium is not all that one could desire, it is as good as any we have tried. We have reason to suspect that a medium may be found that will be better to differentiate the fermentative power of soils on green manures. We believe that peptone gelatine would do this; but the difficulties of getting harmonious results with the use of gelatin in as warm a climate as we have here are almost insurmountable. A search for a better medium will be continued; but until one is found the one given will be used.

Plating—The soil infusion is obtained by first removing two inches of the top soil and then mixing the next six inches and carefully weighing off one hundred grams of soil from each pot. This sample is placed in a 500 cc. shaking bottle, 200 cc. of sterile tap water is added, and shook for fifteen minutes in a shaking machine; this is dilution A. In a few moments after being removed from the shaking machine, the sand settles out and one cc. of the supernatant fluid is pipetted off with a sterile one cc. pipette and put into 99 cc. of sterile tap water; this is dilution B. After thorough shaking, place 5 cc. of dilution B into a small flask containing 45 cc. of sterile tap water; this is dilution C. After shaking C place 10 cc. of this dilution into a flask containing 90 cc. of sterile tap water; which gives dilution D. Again shaking and place 10 cc. of dilution D into a flask of 90 cc. of sterile tap water; which gives dilution E.

Duplicate one cc. samples are placed in sterile Petri dishes from dilutions D and E, 1 to 20,000 and 1 to 200,000 respectively, and 10 cc. of the melted synthetic agar, cooled to 45 deg. centigrade, are poured into the dishes and intimately mixed. After the agar has solidified, the dishes are placed in the incubator at 28 deg. centigrade and incubated for three days. The plates are counted using a small tripod lens.

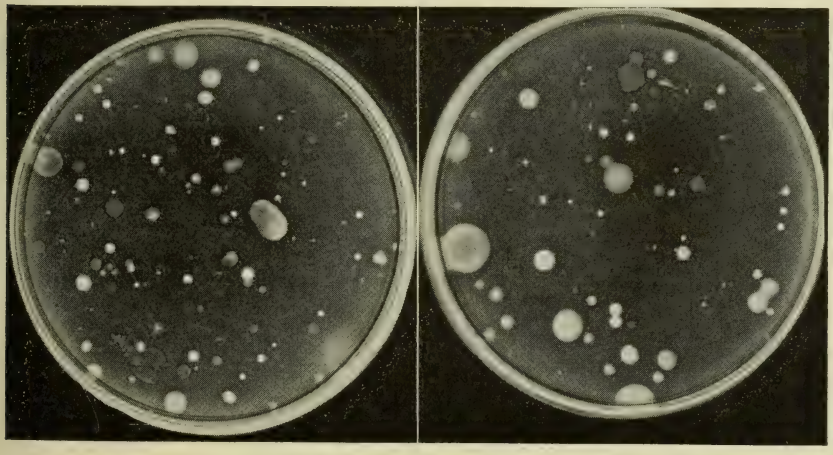

FIG. 2.—Colonies of Soil Bacteria, duplicate plates; dilution 20,000.

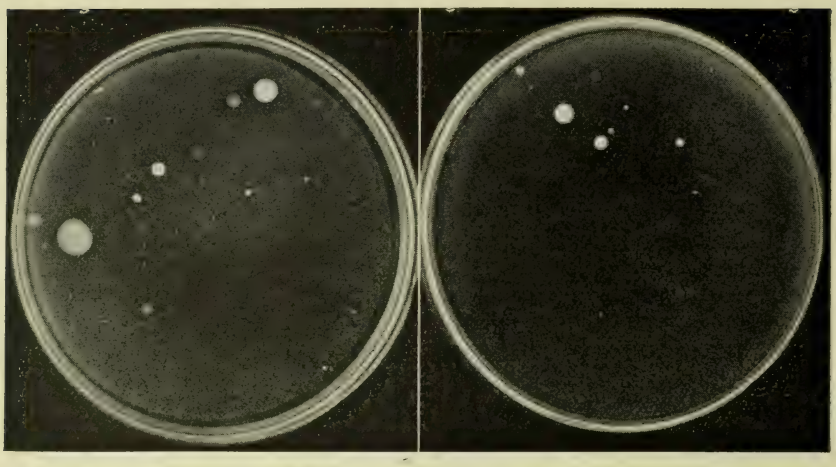

FIG. 3.—Colonies from same soil emulsion as in Fig. 2; dilution 200,000.

(See Figs. 2 and 3.) All colonies occurring on the agar were included in the count. Table 8 shows the average counts made from samples taken on Jan. 2, Jan. 28, and March 9, 1914.

On the whole the results correspond fairly well with the result of the vegetative tests. (See Table 9.)

It will be noted that on Jan. 2, No. 3 shows a depression in numbers where the ground limestone was added. The opposite result is noted Jan. 28 and March 9. The result from the last two dates correspond with the vegetative test and is what would be expected from the addition of the ground limestone. The reason for the depressed result on Jan. 2 is not evident. This lack of correspondence of the bacterial counts and the vegetative tests is only noted in a few instances. It may be due to the difficulty in making accurate counts. But since the correspondence far outweighs the discrepancies; and the fact that the general average has a tendency to harmonize the results, puts it beyond question, that there is an intimate relation between the fertility of the soil and the bacterial counts. (See Table 9.)

TABLE 8.—Average Bacterial Counts at Three Testings.

TREATMENT	DATE OF TESTINGS.		
	Jan. 2.	Jan. 28.	Mar. 9.
Nothing added	6,443,000	2,230,000	4,143,000
No lime & 2 T. A1.	7,560,000	3,329,000	5,145,000
3 T. G. L. & 2 T. A1.	7,155,000	4,438,000	5,610,000
3 T. G. L. & 4 T. A1.	6,044,000	4,220,000	6,890,000
3 T. G. L. & 4 T. A1.& 2 T. H. M.	7,476,000	5,780,000	8,220,000
3 T. G. L. & 4 T. A1.& 2 T. C. M.	6,478,000	5,560,000	8,445,000
3 T. G. L. & 4 T. A1.& 1 T. R. P & 2 TH.M.	8,637,000	5,109,000	7,780,000
3 T. G. L. & 4 T. A1.& Bact. Culture	7,778,000	5,560,000	7,560,000
3 T. G. L. & 4 T. A1.& 1 T. R. P. & Bac. Cul.	8,188,000	4,439,000	7,986,000
3 T. G. L. & 4 T. A1.& 1 T. R. P. & 2 T. H. M. & Bact. Culture	6,010,000	5,001,000	8,560,000

Abbreviations same as for Table 7.

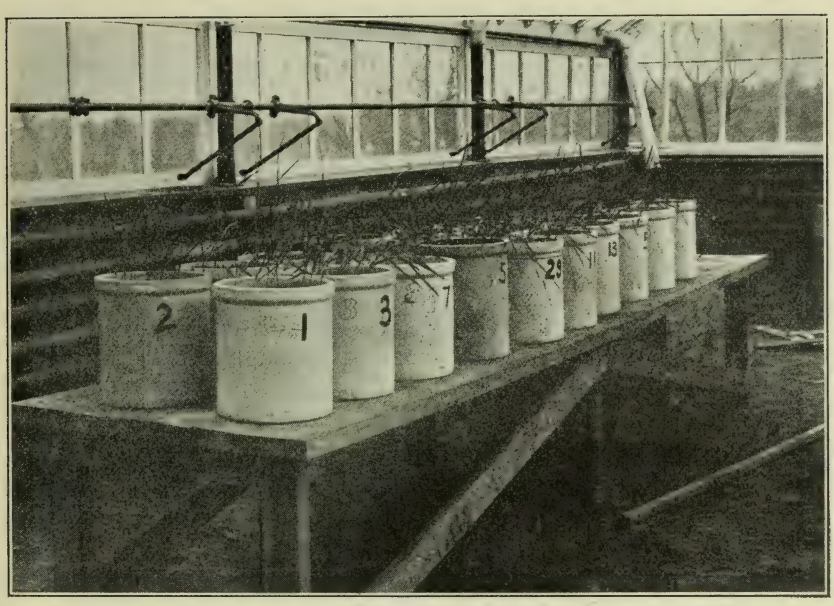

FIG 4.—Oats in Series I, January 9, note the uniform start.

Physiological Tests.—These tests were made each time with the quantitative bacterial determinations. The results were not satisfactory. This was due, in part, to faulty apparatus that has been remedied by purchasing new; and probably also to some fault in the technique which is being improved. The results for this reason are not included.

Vegetative Tests.

The vegetative tests were made by planting a second series of jars to oats. This series was treated just like the one used for the bacteriological tests already described. The oats were planted in duplicate jars Dec. 3, 1913. They came up well and were thinned to ten stalks per jar. They were watched each day and watered when necessary to keep them in good tilth. Rain water from a glass roof was used for the watering.

The oats were harvested, March 26, 1914, cutting the stalks just above the ground. The green and dry weights, and the number of milligrams of nitrogen per dry gram of substance were determined. The results are given in Table 9.

It will be seen that these results harmonize almost perfectly with the bacterial counts. It is very evident that the main thing lacking in this soil is organic matter. Where two tons of the alfalfa, only, were added the oats crop was practically five times that of the check jars with nothing added. (See Fig. 6.)

FIG. 5.—Oats in Series I, February 28, note the difference in growth due to treatment. (See Table 7.)

The addition of limestone in this particular case gave a very slight increase. It will be noted that the light dressing of horse and cow manures each gave a marked increase in the crop. It is further noted that where the bacterial culture was added in place of the light dressing of stable manure the increase in the oats crop was as great, in this case

TABLE 9.—The average bacterial counts, the weights and nitrogen content of the oats straw.

	TREATMENT.	Average of three Bacterial Counts.	Oats Straw		Pounds of nitrogen per ton of Straw.
			Green Weight.	Dry Weight.	
1	Nothing added	4,272,000	29.85	7.8	11.2
2	No lime & 2 T. Al.	5,345,000	127.65	32.7	16.8
3	3 T. G. L. & 2 T. Al.	5,734,000	135,55	32,75	16,4
4	3 T. G. L. & 4 T. Al.	5,718,000	161,00	36.50	25.0
5	3 T. G. L. & 4 T. Al. & 2 T. H. M.	7,155,000	186.15	38.15	26.8
6	3 T. G. L. & 4 T. Al. & 2 T. C. M.	6,827,000	174.85	37.30	24.4
7	3 T. G. L. & 4 T. Al. & 1 T. R. P. & 2 T. H. M.	7,176,000	194.50	42.00	23.2
8	3 T. G. L. & 4 T. Al. & Bac. Cul.	6,966,000	191.00	41.15	23.8
9	3 T. G. L. & 4 T. Al. & 1 T. R. P. & Bac. Culture	6,871,000	186.10	40.95	23.8
10	3 T. G. L. & 4 T. Al. & 1 T. R. P. & 2 T. H. M. & Bac. Culture	6,524,000	171.90	38.55	23.0

Abbreviations same as for Table 7.

slightly greater, than where the horse manure or cow manure was applied. This indicates that the benefit of a slight dressing of stable manure, when added with a green manure is due in large part at least to the increased bacterial activity induced by adding the bacteria with this manure (See Fig. 4 and 5).

FIG. 6.—Oats in Series I, January 26; Nos. 1 and 2 nothing added, 3 and 4 two tons of alfalfa per acre.

The beneficial effect of the bacterial culture was readily noted in the oats crop to which these cultures had been added by the darker green color and the ranker growth.

The pots receiving both the light dressing of stable manure and bacterial culture; did not give as large a growth as where these were applied separately. This effect is also noted in the smaller bacterial count. (See Table 9.) Just to what this effect was due is not evident. It may be that there was some antagonism between the organisms of the bacterial culture and those in the stable manure. It does not appear that it could have been due to an acid reaction of the soil since there was an abundance of limestone added.

It should be noted that the nitrogen content of the oats straw varied with the amount of fertilizer added. In the jars where nothing was added the analysis shows only 11.2 pounds of total nitrogen per ton of oats straw; where the two tons of alfalfa was turned the analysis showed 16.8 and 16.4 pounds of nitrogen respectively; and with 4 tons

of green manure gave an analysis of 25 pounds of nitrogen per ton of straw. Not only does the better fertility give a better growth; but also a better quality of feed as shown by the greater amount of nitrogen present.

FIG. 7.—Oats in Series I, January 26 (Lower Numbers apply).

1. Nothing added.
2. Two tons of alfalfa per acre. (No lime.)
3. Two tons of alfalfa and three tons lime per acre.
4. Four tons alfalfa and three tons lime per acre.
5. Four tons alfalfa, three tons lime per acre and bacterial culture added

CONCLUSIONS.

1. There is a direct relation between the bacterial count and the amount of organic matter added.

2. The quantitative bacteriological test and the vegetative test agree very uniformly.

3. A light dressing of stable manure with a green manure gives a marked effect as shown both by the crop grown and the bacterial counts.

4. The addition of a bacterial culture along with the green manure has as great an effect as the addition of the light dressing of stable manure which indicates that the benefit of the addition of the stable manure is due largely to the addition of the bacteria contained in the manure.

5. The addition of organic matter gives not only a larger growth but a better quality of feed as shown by the analysis for total nitrogen in the straw.

Mississippi Agricultural Experiment Station

BULLETIN No. 169.

COTTON EXPERIMENTS 1914

AGRICULTURAL COLLEGE, MISSISSIPPI
DECEMBER, 1914.

TUCKER PRINTING HOUSE JACKSON MISS

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*In co-operation with U. S. Department of Agriculture.

INTRODUCTION

In this bulletin are given the results from some of the cotton experiments for 1914 from the Central Station at the A. and M. College and two of the branch stations; namely, the Holly Springs Branch Station at Holly Springs, Miss., and the Delta Branch Station at Stoneville, Miss.

The results from similar cotton experiments previous to 1914 are published in Bulletins 155, 161, and 164. These bulletins may be had upon application to the Director of the Experiment Station, Agricultural College, Mississippi.

RESULTS FROM THE CENTRAL STATION.

By E. C. EWING and J. R. RICKS.

THE WEATHER.

TABLE 1.—Temperatures and Rainfall, 1914.

MONTH.	TEMPERATURES.				RAINFALL.	
	Minimum.	Average Minimum.	Maximum.	Average Maximum.	Total rainfall inches.	No. of day on which rain fell.
January	26	36.5	75	57.4	1.05	4
February	20	35	73	56.5	4.22	10
March	23	41.2	82	62.4	6.19	13
April	31	52.4	88	75.6	5.46	9
May	47	60	98	84.4	2.15	7
June	68	72.3	103	96.9	5.06	6
July	65	72	103	96.5	.85	6
August	64	70.5	96	91	7.37	18
September	53	63.8	95	87	7.10	7
October	29	56	88	77	2.00	12
November	15	41.8	85	61	3.00	7
December	13	34.8	69	48.6	6.47	15
Total rainfall					50.92	114

VARIETY TEST.

In Table 2 are shown the results of comparative field tests with sixteen varieties supposed to have been the most promising varieties of their respective classes. The first four are early short staple varieties; the next eight are medium early, big bolled, short staple varieties; and the last four are long staple varieties. The table shows the yields of seed and lint made by each variety under the same conditions and the value per acre of these products at market prices. The samples were classed at Greenville, Miss., on November 5, 1914, and the values are based on the market of that date.

The samples of each variety were considered as being of strict middling grade and the values assigned are the prices that were being paid for each of the different lengths of staple in strict middling grade at that time.

On the whole the medium early, big bolled varieties made the best yields, but some of the long staple varieties returned the greatest money values per acre, due to the premiums paid for these staples at that time.

This field was infested from the first to the last of the season with boll weevils, which did a moderate amount of damage. The weevils were controlled to a considerable extent by picking the adult weevils and the squares and to a large extent by the hot dry weather which occurred in June and July. This cotton was planted April 20th and 21st and got an early start. Boll weevils appeared in considerable numbers early in the season. As soon as squares began to appear and were punctured, these punctured squares were picked and destroyed as were also any adult weevils found. These measures were continued through June and most of July and, together with the effect of the hot dry weather prevailing at that season, permitted a good crop to be made.

Had the weather been rainy and cloudy and had the picking of the punctured squares been relaxed, the relative standing of the varieties would probably have been different and more favorable to the early varieties. The earliest varieties began to square first and as a result were infested first by the weevil. This was a slight disadvantage to them and the artificial and natural control which continued through a large part of the fruiting season was favorable to some of the varieties that are somewhat later. The early maturing varieties have never given the largest yields here without the boll weevil and a dry season is favorable to the medium early big bolled varieties. These varieties have more extensive root systems, are more vigorous in their habits of growth, and are consequently more drouth-resistant. It is our opinion that under average conditions on poor thin land or land of medium fertility, with the boll weevil present, these medium early, big bolled varieties such as Wannamaker-Cleveland, Cook, Half and Half (a selection from Cook), and Miller will give better results than the very early, quick maturing varieties, which suffer worse from drouth and rust and quit growing early under such conditions. Besides, there does not seem to be as much difference in earliness between the earliest and the latest varieties on thin land as there is between the earliest and the latest varieties on rich land. On rich bottom lands in the presence of the boll weevil, one of the early maturing varieties that does not make too much stalk will be the most satisfactory. In this class there are no better varieties than Trice and Dodd's Prolific. In most tests in this State Trice has given better results than Dodd's Prolific.

We regard Express* as the best available long staple variety for boll weevil conditions. It is an early inch and three-sixteenths cotton that has given splendid results in the Delta. Unknown is another good early variety that runs from an inch and an eighth to an inch and three-sixteenths.

*See circular on Express Cotton published by this Station for a discussion of this variety.

TABLE 2.—VARIETY TEST AT CENTRAL STATION, 1914.

NAME OF VARIETY.	Seed cotton first picking.	Seed cotton second picking.	Total Seed cotton per acre.	Per cent lint.	Lint per acre.	Length of staple	Value per pound.	Value of lint per acre.	Seed per acre.	Value of seed per acre at $12.00 per ton.	Total value of lint and seed per acre.
	lbs.	lbs.	lbs.			Inch.	Cents.				
1. Trice	1096	347	1443	31	447	1 f*	7 1-4	$32.40	996	$5.95	$38.35
2. Simpkins	1090	300	1390	34	473	7-8	7	33.10	917	5.50	38.60
3. Simpkins Ideal	987	300	1287	35	450	7-8	7	31.50	837	5.00	36.50
4. Dodd's Prolific	1187	383	1570	32.2	505	1	7 1-8	36.00	1065	6.40	42.40
5. Wannamaker-Cleveland	789	789	1578	38.4	606	1 f	7 1-4	43.90	972	5.85	49.75
6. Cleveland	549	754	1303	36.3	473	11-16	8 1-4	39.00	830	5.00	44.00
7. Cook's Cook	668	870	1538	38.0	584	3-4	7	40.90	954	5.70	46.60
8. Alabama Cook	982	694	1676	40.0	670	3-4	7	46.90	1006	6.00	52.90
9. Half and Half	896	637	1533	43.9	673	3-4	7	47.10	860	5.15	52.25
10. Triumph	710	740	1450	38.7	561	1 f	7 1-4	40.65	889	5.30	45.95
11. Miller	745	844	1589	36.5	580	1 1-16	8 1-4	47.85	1009	6.05	53.90
12. Express	1168	399	1567	28.2	442	1 1-8 f	11	48.60	1125	6.75	55.35
13. Unknown	824	606	1430	32.5	465	1 1-8	9 1-2	44.20	965	5.80	50.00
14. Durango	610	544	1154	33.0	381	1 1-8 f	11	41.90	773	4.65	46.55
15. Columbia	630	694	1324	32.0	424	1 3-16	12 1-2	53.00	900	5.40	58.40
16. Sunflower	694	528	1222	28.3	346	1 3-8	14 1-2	50.20	876	5.30	55.50

*Full

VARIETY TEST ON WILT INFESTED LAND.

During the past three years we have conducted a variety test each season on land that is moderately infested with the cotton wilt disease, or blight. In these we have used a few varieties susceptible to the disease and some of the wilt-resistant varieties, all short staple varieties.

Variety.	Yield of Lint Per Acre.
Test of 1912.	
Dixie	260
Covington-Toole Wilt-resistant	270
Trice	216
Peterkin	253
Dillon	225
Triumph	249
Test of 1913.	
Dixie	218
Trice	185
Covington-Toole Wilt-resistant	238
Simpkins	179
Test of 1914.	
Dixie	176
Trice	212
Covington-Toole Wilt-resistant	206
Simpkins	229

In the test of 1912 Dixie, Covington-Toole Wilt-resistant, Peterkin and Dillon are all relatively immune to the disease, while Trice and Triumph are very susceptible. Dixie, Covington-Toole Wilt-resistant, and Dillon have been bred for resistance to this disease and introduced for that quality. In the tests of 1913 and 1914 Dixie and Covington-Toole Wilt-resistant are the resistant varieties and Trice and Simpkins the susceptible varieties.

The soil on which these tests were made is a silt loam. Here the infected plants usually do not die at once from the effects of the disease but most of them continue to develop a fair crop. However, every plant in the rows of susceptible varieties showed some effects of the disease finally, and usually a good many of the plants of the wilt-resistant varieties wilted more or less.

Boll weevils did not affect the crop of 1912; they injured it slightly late in the season of 1913; but weevils were present throughout the summer and fall of 1914 and affected the yields considerably.

The wilt-resistant varieties generally gave the best yields in 1912 and 1913 but fell below the susceptible varieties in 1914. This is on account of the effects of the boll weevil. The wilt-resistant varieties are all late and cannot be successfully grown where weevil damage is heavy. At the same time, the early varieties that we have found all seem to be rather susceptible to wilt, so the combination, where both wilt and weevils are present to a serious extent, makes cotton growing out of the question.

The Covington-Toole Wilt-resistant variety has yielded more cotton than any of the other wilt-resistant varieties in all tests that have been made with it at this Station.

DISTANCE EXPERIMENTS.

TABLE 3.—Width of Rows, 1914.

PLAT.	First picking pounds seed cotton per acre.	Sec. picking pounds seed cotton per acre.	Total yield pounds seed cotton per acre.
3 ft. rows	1536	124	1660
3½ ft. rows	1184	152	1336
4 ft. rows	1068	152	1220
4½ ft. rows	992	208	1200
5 ft. rows	960	216	1176

TABLE 4.—Distances in the Drill. 1914.

PLAT	First picking pounds seed cotton per acre.	Sec. picking pounds seed cotton per acre.	Total yield pounds seed cotton per acre.
12 inches	1105	448	1553
24 inches	977	426	1403
36 inches	772	381	1153

In the above plats the rows were four feet apart, and the cotton grew to four feet in height. The variety of cotton was Cleveland Big Boll. The weevils seemed to have gotten all of the squares after the 10th of August. No fight was made on the weevils in these plats.

TABLE 5.—Manure and Kainit to Prevent Rust. 1914.

PLAT.	First picking pounds seed cotton per acre.	Sec. picking pounds seed cotton per acre.	Total yield pounds seed cotton per acre.
No treatment	476	8	484
Kainit 300 lbs. per acre	1504	228	1732
Manure applied in 1911	1540	268	1808
Manure applied in 1913	1550	280	1830

These plats were on land on which cotton has always rusted badly. An application of 300 pounds of kainit is almost as good as an application of ten tons of barnyard manure, but the kainit must be added each year whereas the manure lasts for several years, as will be seen in the above plats.

RESULTS FROM THE HOLLY SPRINGS BRANCH EXPERIMENT STATION.

By C. T. Ames.

Remarks.—All of the fertilizer plats planted to cotton in 1914 were planted about as early as the weather would permit in this latitude. The growth of the stalk was below normal. The season was excessively dry, and the yield of cotton was above the average for this section.

Under average conditions the early varieties of cotton should be planted on valley land, and the larger big boll and later varieties should be confined principally to hill land. Cleveland-Wannamaker, Trice, and Cooks are most excellent early short staple varieties. Express is also an excellent early variety with staple 1 3-16 inches in length. Cleveland Big Boll is an early variety, and most excellent for the hill lands of this section.

Fertilizers.—The use of both nitrogen and phosphorus, either alone or in combination, has given very satisfactory results. Phosphorus hastens maturity.

The use of potash, either alone or in combination with the other elements, appears to be unnecessary in these soils.

On thin upland the use of 200 to 300 pounds of an equal mixture of cottonseed meal and acid phosphate per acre, placed about three inches deep under the seed, should give very satisfactory results. On the more fertile soils the quantity of phosphorus may be increased to advantage.

After leguminous crops phosphate alone at the rate of from 200 to 400 pounds per acre can be used to profit.

Where leguminous crops are to be grown, from 300 to 400 pounds of rock floats can be used to advantage. Where rock floats is mixed with manure the results are most satisfactory.

If ten pounds of crimson clover seed were sown, per acre, in cotton after a rain in September and covered with a cultivator, rock floats would supply our fertilizer requirements.

HOLLY SPRINGS BRANCH EXPERIMENT STATION—

TABLE 6.—VARIETY TEST WITH COTTON.

Date of Planting.—April 29, 1914. **Soil.**—Brown loam valley.
Plats.—One row each, repeated four times.

PLATS.	Dates of Picking.				Total per Plat.	Per cent lint.	Length of staple.	Pounds per acre Seed cotton.	Pounds of lint per per acre.	Pounds of seed per per acre.	Value of seed and lint per acre.
	Sept. 10.	Sept. 28.	Oct. 20.	Nov. 5.							
0. Trice	199lb	113.5	00.0	3.0	329.5	31.1	1 1-16	1845.2	573.8	1271	$54.95
1. Trice (College)	192	131	22	3	348	31.7	1 1-16	1948.8	617.7	1331	58.93
2. Simpkins	178.5	134.7	15.7	4.5	332.7	34.8	7-8	1863.1	648.3	1214	53.48
3. Simpkins Ideal	174	140.5	14.5	4.5	333	35.1	7-8	1864.8	654.5	1210	53.89
4. Dodd's Prolific	208.5	159.2	20	5	392.7	32.5	1	2199.1	714.6	1485	60.70
5. Cleveland Wannamaker	153	217.2	46.5	7.5	424.2	37.5	1	2375.5	890.8	1484	73.47
6. Cleveland Big Boll	118.2	233.5	76.2	10.0	437.9	36.5	1 f	2452.2	895	1557	74.56
7. Cook from Cook	101	257	74.5	8	440.5	38.3	3-4	2464	943.7	1521	75.17
8. Cook's Alabama Station	151.5	261.5	40	4.5	457.5	40	3-4	2562	1024.8	1538	80.95
9. Half and Half	141	235	26	9.5	411.5	44.2	3-4	2304.4	1018.5	1186	78.40
10. Triumph	95	189	67.5	15.0	366.5	38.5	1	2052.4	790	1262	64.84
11. Miller	130.5	212	69.2	9	420.7	36.1	1 1-8	2355.8	850.4	1405	83.82
12. Express	198.5	162.5	32	9.5	402.5	29.1	1 3-16	2254	655.9	1699	92.16
13. Allen's Unknown	125	160	41.5	14	340.5	32.7	1 3-16	1906.8	623.3	1283	85.59
14. Durango	106.5	214.5	42	14	377	33.5	1 3-16	2111.2	707	1404	96.79
15. Columbia	81.7	206.5	69.5	15.5	373.2	32.5	1 3-16	2089.9	679	1410	93.33
16. Sunflower	109.7	194.5	69.7	12	385.9	28.7	1 5-16	2161	442	1719	74.40

The following prices were given at Greenville, Miss., Nov. 15, 1914, for strict middling grade:
3-4 inch, 7 cts.; 7-8 inch, 7 1-8 cts.; 1 inch, 7 1-4 cts.; 1 1-16 inch, 8 1-4 cts.; 1 1-8 com., 8 3-4 cts.; 1 1-8 full, 11 cts.; 1 3-16 inch, 12 1-2 cts.; 1 5-16 inch, 14 1-2 cents. Cotton seed were figured at $12.00 per ton which was the market price on the above date.

Remarks.—Season dry. Yield above the average. Normal differences between price of short and long staple affected results.

TABLE 7—HOLLY SPRINGS BRANCH EXPERIMENT STATION.

Date of Planting.—April 29, 1914.

Variety.—Cleveland Big Boll.

Soil.—Rolling hill land, clay loam.

Plats.—1–20 acre each.

200lb Fertilizer per Acre.	Dates of Picking.			Total per plat	Pounds of Seed Cotton per Acre.	400lb Fertilizer per Acre.	Dates of Picking.			Total per Plat.	Pounds of Seed Cotton per Acre.
	Sept. 12.	Oct. 6.	Oct. 28. Plat.				Sept. 12.	Oct. 2.	Oct. 28.		
1. No Fertilizer	6.5	15	7	28.5	570 lb	1½. No Fertilizer	5.5	18.5	5	29	580 lb
2. 200lb Cottonseed Meal	11	23	13	47	940	2½. 400lb Cottonseed Meal	6.5	20	7	33.5	670
3. 200 lb Acid Phosphate	27	27	4.5	58.5	1170	3.½. 400lb Acid Phosphate	25	39	3	67	1340
4. 200lb Kainit	11	21	6	38	760	4.½. 400lb Kainit	7	21	4	32	640
5. No Fertilizer	8	17.5	7	32.5	650	5½. No Fertilizer	0	17	4	21	420
6. 100lb Cottonseed Meal 100lb Acid Phosphate	29.5	23	3	55.5	1110	6½. 200lb Cottonseed Meal 200lb Acid Phosphate	25	38.5	2	65.5	1310
7. 100lb Cottonseed Meal 100lb Kainit	7.5	21.5	9	38	760	7½. 200lb Cottonseed Meal 200lb Kainit	14.5	33	5.5	53	1060
8. 100lb Acid Phosphate 100lb Kainit	21.5	22.5	3.5	47.5	950	8½. 200lb Acid Phosphate 200lb Kainit	23	27.5	1.5	52	1040

TABLE 7—HOLLY SPRINGS BRANCH EXPERIMENT STATION.—Continued.

9. 120lb Acid Phosphate... 40lb Cottonseed Meal 40lb Kainit	23.5	20.5	3	47	940	9½. 240lb Acid Phosphate... 80lb Cottonseed Meal.. 80lb Kainit	27	30.5	2	59.5	1190
10. No Fertilizer	8.5	15	4.5	28	560	10½. No Fertilizer	0	24	3	27	540
11. 150lb Cottonseed Meal 50lb Acid Phosphate...	22.5	21	3	46.5	930	11½. 300lb Cottonseed Meal.. 100lb Acid Phosphate	25	36.5	2.5	64.2	1280
12. 100lb Cottonseed Meal 100lb Acid Phosphate...	22	23	4	49	980	12½. 200lb Cottonseed Meal.. 200lb Acid Phosphate	17	31	2.5	50.5	1010
13. 150lb Acid Phosphate... 50lb Cottonseed Meal	14.5	21	6.5	42	840	13½. 300lb Acid Phosphate... 100lb Cottonseed Meal..	17.5	28	1	46.5	930
14. No Fertilizer	6	14	7	27	540	14½. No Fertilizer	7	17	1	25	500

Remarks.—All plats were located in the field as indicated in this Table, with only a six foot space between the two sets of plats. Each of the above plats have been fertilized, each year, for the past nine years with the same kind and quantity of fertilizer as indicated in Table. Past season very dry, with yield a little above the average.

HOLLY SPRINGS BRANCH EXPERIMENT STATION.

TABLE 8.—FERTILIZER TEST WITH COTTON.

Date of Planting.—April 30, 1914.
Soil.—Red clay hill land, somewhat irregular in texture and fertility.
Plats.—1–20 acre each.

Plat No.	Fertilizer.	Yield.	Plat No.	Fertilizer.	Yield.	Plat No.	Fertilizer.	Yield.
1.	1000 lb Air slacked lime	980 lb	6.	200 lb Acid Phosphate	1160 lb	11.	200 lb Cotton seed meal	1380 lb
2.	No Fertilizer	1070	7.	200 Kainit	1180	12.	200 lb Rock Floats	1210
3.	100 lb Cottonseed Meal 100 lb Acid Phosphate	1080	8.	100 Cottonseed Meal 100 Acid Phosphate 100 Kainit	1270	13.	No Fertilizer	1280
4.	200 lb Rock Floats	950	9.	No Fertilizer	1280	14.	100 Cottonseed Meal 100 Acid Phosphate 100 Kainit	1510
5.	200 lb Acid Phosphate	1310	10.	200 lb Rock Floats	1290	15.	No Fertilizer	1670

Remarks.—All plats were located in the field as indicated in table. Plats from one to five are on heavy clay soil which changes gradually into a clay loam in plats 11 to 15.

Plat 1 is on the poorest soil, and plat 15 on the most productive.

Plats 5, 10, and 15, were limed at the rate of 2,000 lb of ground lime stone, and manured at the rate of ten tons of manure, per acre, two years prior to planting in cotton.

HOLLY SPRINGS BRANCH EXPERIMENT STATION.
FERTILIZER TEST WITH COTTON.

Date of Planting.—April 29, 1914. **Soil.**—Rolling hill land, somewhat irregular in fertility. **Plats.**—1-20 acre each. **Variety.**—Cleveland Big Boll.

TABLE 9.—Fertilizer Test with Cotton.

	Dates of Picking.			Total per Plat.	Pounds of Seed Cotton per Acre.
	Sept. 10.	Oct. 2.	Oct. 28.		
1. No Fertilizer	3.5	21	5.5	30	600lb
2. 200lb Cottonseed Meal	14	21.5	7	42.5	850
3. 200lb Acid Phosphate	16	19	3	38	760
4. 200lb Kainit	7	11.5	6	24.5	490
5. No Fertilizer	6.5	15	6	27.5	550
6. 200lb Rock Floats	16.5	30	6.5	53	1060
7. 400lb Rock Floats	21.5	29	5	55.5	1110
8. 200lb Acid Phosphate	24	19.5	3.5	47	940
9. 100lb Cottonseed Meal, 100lb Acid Phosphate	15	29	9.5	53.5	1070
10. 100lb Cottonseed Meal, 200lb Rock Floats	18	30	11.5	59.5	1190
11. No Fertilizer	11.5	16	7	34.5	690
12. 100lb Cottonseed Meal, 200lb Acid Phosphate	16	19.5	9	44.5	890
13. 200lb Acid Phosphate	21.5	25.5	5	52	1040
14. 400lb Rock Floats	16	25	5.5	46.5	930
15. 200lb Kainit	14.5	26	10	50.5	1010
16. No Fertilizer	8.5	24	10.5	43	860
17. 200lb Rock Floats	11	21.5	8.5	41	820

Remarks.—Plats are located in field as indicated in above table.

RESULTS FROM THE DELTA BRANCH STATION.

By G. B. Walker.

Variety Test.—In the following table we give a list of the varieties of cotton tested at the Delta Branch Station, at Stoneville, in 1914, with data which gives showing made by each variety.

The cotton in this test was planted on May first, but was destroyed by hail storm on May 4th, and was planted a second time on May 20th, but on account of drought which prevailed at that time, a stand was not secured until June 4th.

The land on which the test was made, was of a loamy nature and in rather a low condition, no fertilizer being used.

Owing to the very late date of securing a stand and to a heavy infestation of boll weevil, the yield per acre is very low, but we consider it a very valuable test from a boll weevil standpoint, as the cotton had only about seventy days to grow and set a crop, since no fruit was set after August 10th. Only the very early cottons had any show at all at making a crop.

The boll weevil made its appearance in this field early in July, but did not get numerous enough to take all forms until after August 4th.

Samples of lint from all the varieties were classed and a value placed on them by the O. B. Crittenden Cotton Co., of Greenville, Mississippi, and our calculations are based on information furnished by this firm.

TABLE 10.—VARIETY TEST—DELTA STATION.

VARIETY.	Pounds Seed cotton per acre.	per cent of lint.	Pounds lint cotton per acre.	Length of staple.	Price lb strict middling basis Dec.1 market.	Value of lint per acre.	Value seed per acre at $20.00 per ton.	Total value of lint and seed per acre.	Rank as to money value per acre.
Express	640	27	173	1-3-16	12-1-2	$21.62	$ 4.67	$ 26.29	1
Trice	752	30	225	1-1-16	8	18.00	5.27	23.27	2
Unknown	520	31	161	1-1-8 f	11	17.71	3.59	21.30	3
Miller	540	35	189	1-1-8 c	8-1-2	16.06	3.51	19.57	4
Dodd's Prolific	600	30	180	1-1-16	8	14.40	4.20	18.60	5
Simpkins' Ideal	596	33	196	Short	7	13.72	4.00	17.72	6
Wannamaker-Cleveland	524	37	195	1	7-1-4	14.14	3.29	17.43	7
Columbia	360	31	112	1-3-16 f	13	14.56	2.48	17.04	8
Dalrymple	424	36	153	1-1-8 c	8-1-2	13.00	2.71	15.71	9
Cleveland	480	33	158	1-1-16	8	12.64	2.22	14.86	10
Half and Half	424	41	174	Short	7	12.18	2.50	14.68	11
Alabama Station Cook	448	38	170	Short	7	11.90	2.78	14.68	12
Cook's Cook	432	36	155	Short	7	10.85	2.77	13.62	13
Sunflower	320	26	81	1-1-4 f	14	11.34	2.19	13.53	14
Triumph	344	37	127	1-1-16	8	10.15	2.17	12.32	15
Bates	328	38	125	1	7-1-4	9.06	2.03	11.09	16
Durango	240	31	74	1-1-8 f	11	8.14	1.66	9.80	17

DELTA BRANCH EXPERIMENT STATION.

TABLE 11.—Second Variety Test, 1914.

NAME OF VARIETY.	First row.	Second row.	Total.	Per cent lint.	Yield of lint.
Re-improved King	15.5	16.0	31.5	32.3	10.1
Piedmont	19.0	18.0	37.0	29.7	11.0
Ghoulston's Triumph	10.5	13.5	24.0	31.0	7.3
Stone and Fort Triumph	8.5	10.0	18.5	31.9	5.9
Alabama 6B–97–27	7.0	9.0	16.0	32.4	5.2
Alabama Cleveland 316	9.0	11.5	20.5	34.0	7.0
Alabama Cleveland 323	8.0	7.0	15.0	32.1	4.9
Alabama Cook 675	10.0	12.0	22.0	36.5	8.0
Alabama	7.0	12.0	19.0	33.4	6.8
Jake's Big Boll	12.5	10.0	22.5	33.4	7.5
Wood's Favorite	8.5	10.0	18.5	29.6	5.5
Piedmont Long Staple	8.0	9.0	17.0	27.5	4.7
Willis' Columbia	11.5	13.0	24.5	29.5	7.2
Webber 49	12.0	12.5	24.5	32.4	7.9
28–370	11.5	14.0	25.5	26.5	6.8

The second variety test is a small test conducted on a small scale in which certain varieties are grown in most cases for the first time. A larger test is made every year of the most promising varieties and the results are published in the Station Bulletins. Our object in conducting the smaller test is to get familiar with these new varieties to see whether they justify testing on a larger scale in the regular variety test. Our opinion is based as much on the result of observation in the field as on the figures for final yield, which are not considered as establishing the relative merit of the different kinds because of the small area devoted to the test. They are submitted here, however, to those making inquiry for whatever they may be worth.

Mississippi Agricultural Experiment Station

BULLETIN No. 170.

CORN

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*In co-operation with U. S. Department of Agriculture.

CORN

Results from Central Station.

By J. R. Ricks.

THE WEATHER.

TABLE 1.—Rainfall for Four Years.

	1911	1912	1913	1914
January	5.49	4.90	7.74	1.05
February	3.75	2.91	7.80	4.22
March	1.45	9.41	6.16	6.19
April	10.07	13.20	2.53	5.46
May	1.92	4.68	4.12	2.15
June	5.88	6.95	1.79	5.06
July	6.24	6.77	3.58	.85
August	5.10	7.47	2.09	7.37
September	.20	5.05	7.93	7.10
October	2.18	5.20	2.71	2.00
November	4.28	1.00	2.63	3.00
December	11.83	8.96	3.72	6.47
Total	58.37	76.50	52.82	50.93

CORN.

INTRODUCTION.

On the following pages will be found the results from experiments conducted at this Station since 1910. These consist of variety testing, cost of growing, different times of planting, fertilizers, cultural methods, subsoiling, spacing, suckering, and experiments with corn for silage. All of these tests were conducted on soils of medium fertility without any regard for big yields, the idea being to get comparative data on soils of about the same degree of fertility as would be found on the average farm of the state.

On page 13 will be found the results of similar experiments at the Holly Springs Branch Experiment Station, conducted by Mr. C. T. Ames.

TABLE No. 2.—Four Years Variety Test.*

Name of Variety	1911 Yield in bushels per acre ear corn	1912 Yield in bushels per acre ear corn	1913 Yield in bushels per acre ear corn	1914 Yield in bushels per acre ear corn
Cocke's Prolific	31.5	38.09	44.2	53.8
Tennessee Red Cob	35.3	35.96	31.2	59.4
Station Mosby	30	30.87	37	49.1
Davis' Poor Land	31.1	32.93	38.3	48.4
Hastings	34.1	35.63	37.5	46.6
Boone County White	22.1	31.13	32.7	44.5
Batts' Four Ear	34.1	35.29	34.3	41.7
Munson	31.5	28.06	36.2	42.8
Florida Flint		32.53	36.9	44.5
Rockdale		30.25	36.1	39.7
Leaming		34.22	31.5	35.5
Godby's Poor Land	37.9	29.63	37.5	
Mosby (Carr's)	32.3	32.21	34.1	
Gourd Seed	31.1	28.60	37.6	
Square Deal	28.9	31.95	29.7	
Yellow Dent	27.7	30.68	26.3	
North Carolina Prolific			36.7	52.8
Jones' Prolific			36.9	50.7
Vardaman			39.2	49.8
New Era			35.6	44
E-1	35.3		33.8	
Huffman	33.8	30.90		
Marlboro	30.8	36.75		
Shoe Peg	30.8	27.62		
Chisolm	26.6	34.25		
Surecropper	25.1	31.63		

*The variety tests for 1913 and 1914 were conducted by Mr. E. C. Ewing of this Station.

TABLE No. 2.—Four Years Variety Test.*—Continued.

Name of Variety	1911 Yield in bushels per acre ear corn	1912 Yield in bushels per acre ear corn	1913 Yield in bushels per acre ear corn	1914 Yield in bushels per acre ear corn
Funk's Ninety Day		34	21.9	
Welchell		28.93	29.7	
Rhodes' Mosby				47.7
Hickory King			32.3	
Silvermine			33.2	
Goliad		29.93		

*The variety tests for 1913 and 1914 were conducted by Mr. E. C. Ewing of this Station.

For a number of years this Station has kept accurate data on the cost of growing corn. The records include the data on all of the experimental plats as well as the individual fields in the general crop, which comprises about 125 acres. The average cost to produce an acre of corn on good loam soil free from Johnson grass was as follows:

Rent on the land	$ 4.00
Fall plowing	1.00
Harrowing and planting	1.00
Seed	.50
Six cultivations at $ .50	3.00
Hoeing	1.00
Gathering	2.00
Total	$12.50

The average yield per acre was 47½ bushels, and the cost of producing a bushel was 26.3 cents.

On land heavily infested with Johnson grass the cost of growing corn has averaged $2.00 per acre more than on clean lands when the corn was planted in March or the early part of April.

On account of the damage from the bud worm on plantings made in the latter part of April and during the month of May, the Station usually gets all corn planted early except silage corn, which is planted the first week in June. The silage corn is planted at this time for two reasons: first, because the land is always planted in crimson clover which must be plowed under in May; and, second, because June 1st plantings will mature and be ready to be put into the silo at a time when the labor is not busy with other crops.

The cost of producing an acre of corn planted in June averages about $10.00 per acre. Our experiments show that early plantings are much better than late plantings. See table 5 for comparative yields.

The average annual production of corn in Mississippi for the last three years was 59,372,000 bushels. In addition we have been importing about 20,000,000 bushels at an average price of about 75 cents per bushel, which means that we are sending $15,000,000.00 out of the State for an article that can be produced at home for something like 25 cents per bushel. In many cases the cost is much less than this where large yields are obtained. In 1913 on one of the Station fields we grew corn that cost us 12.5 cents per bushel.

Fertilizers.—No fertilizers were used on any of the general corn tests. We have made a number of tests, however, with the different kinds of commercial fertilizers on corn in small plats and secured practically no returns. A crop of cowpeas gives us better returns than commercial fertilizers. In the brown loam and sandy sections of the state, commercial fertilizers are profitable. An application of 75 to 100 pounds of nitrate of soda per acre in the spring when the corn is from 24 to 36 inches high gives good results in sections where fertilizers are profitable, but here at the Station and in other sections where the land is stiff with a high percentage of lime, the increase in yield is very small as is shown in the following table:

TABLE No. 3.—Nitrogenous Fertilizers under Growing Corn.

Plat	Kind of Fertilizer	Amount of fertilizer per acre	Yield in bushels 1912	Yield in bushels 1913	Average yield two years
1	Nitrate of soda	100 lb.	27.3	40	33.7
2	Sulphate of Ammonia	100 lb.	27.5	41	34.3
3	Check—No fertilizer		26.5	38.4	32.5
4	Cottonseed meal	400 lb.	27.1	39.2	33.2

The average yield for two years shows an increase in yield of 1.2 bushels from the use of nitrate of soda. Allowing a price of 75 cents per bushel, this increase was worth 90 cents. The cost of 100 pounds of nitrate of soda was $2.50 and the cost of applying it was 25 cents, making a total cost of $2.75 per acre. After deducting the value of the increase we have a net loss of $1.85 per acre. The average increase in yield from the use of sulphate of ammonia was 1.8 bushels. At 75 cents per bushel it was worth $1.35. The cost of the fertilizer and making the application was practically the same as for nitrate of soda, or $2.75, making a loss of $1.30 per acre from the use of sulphate of ammonia. While there was some increase from the cottonseed meal plat, there would probably have been more had it been applied before the corn was planted. In this as well as other tests made here, the results show that the use of cotton seed meal on growing corn is more profitable when it is applied before planting.

Variety of Corn to Plant.—The prolific varieties have given us the best yields. Among the most prolific corns might be mentioned Cocke's Prolific, Mosby, North Carolina Prolific, Hastings, and Davis' Poor Land. Of the one-ear type Tennessee Red Cob has given the best yields.

Every farmer should save his seed corn from his own farm by careful selection. However, if it is necessary to buy seed, they should come from a locality where the climatic and soil conditions are as similar as possible to those under which the corn is to be grown. Our native corns when carefully selected give bigger yields than seed brought in from Northern States. The white varieties are also better yielders with us than the yellow varieties.

Preparation of the Soil.—On well drained lands flat preparation and level cultivation give decidedly the best results. Land broken seven to ten inches deep in the fall and harrowed with a disk harrow and a smoothing harrow at the time of planting in the spring is to be desired rather than land broken in the spring. If the land becomes covered with a heavy coating of grass and weeds before planting, it is necessary to break this land again, but this breaking should not be deeper than is necessary to destroy the vegetative growth.

Subsoiling for corn, as well as for any other crop, gives us no returns. On lands where there is a "hard pan," it is advisable to subsoil. A good deep soil well filled with vegetable matter is more easily and cheaply made with the turning plow. The following table shows the results from subsoiling at this Station:

TABLE No. 4.—Subsoiling for Corn.

PLAT	Cost of subsoiling one acre	Yield in bushels per acre 1913	Yield in bushels per acre 1914
Not subsoiled		31.81	30
Subsoiled with plow	$12.00	25.5	27.2
Subsoiled with dynamite	$15.00	27.7	29.1

These plats were on a Houston clay soil of medium fertility. The subsoiling was done in March of 1913. The check plats were broken about seven inches deep.

Time of Planting.—As stated elsewhere, March plantings have given us much better results in grain yields than later plantings.

TABLE No. 5.—Early vs. Late Plantings.

PLAT	Yield in bushels 1911	Yield in bushels 1912	Average yield in bushels
March plantings	56.7	43.00	49.8
June plantings	39.2	30.3	34.7

When the planting is done in March, the seed should be put in the ground from one to two inches. When the planting is done later, it is desirable to plant the seed a little deeper.

Cultivation.—For the best results a thorough and systematic cultivation should be maintained. Until the corn is about 12 inches high, the cultivation should be done with long sharp corn shovels, which will break the soil deep. On early plantings when there is plenty of moisture in the soil this deep cultivation gives good results, but it is not recommended for late plantings. After this the cultivations should as far as possible, be shallow, not exceeding 2 to 2½ inches in depth. However, if conditions should demand it in order to destroy grass, deeper cultivation with any implement that will do the job will necessarily have to be resorted to. During a rainy season, when it is impossible to keep up cultivation and the grass gains such headway that shallow cultivation will not destroy it, a large sweep, plowing deeper than ordinarily, will be necessary to do the work. The cultivations should be continued as late as possible, usually until the corn begins to tassel.

The following tables give the results from flat and ridged cultivations and the different times of "laying by:"

TABLE No. 6.—Flat and Ridged Cultivation.

PLAT	Bushels per acre 1911	Bushels per acre 1912
Flat	39.8	44.5
Ridged	31.5	29.2

These plats were on a well drained soil. The corn was planted flat, cultivated flat, and "laid by" as nearly flat as possible while the ridged plat was cultivated in the usual way for ridged crops except it was "laid by" with a Planet Junior cultivator in order to cover the peas.

TABLE No. 7.—Time of "Laying By."

PLAT	Bushels per acre 1911	Bushels per acre 1912
Corn waist high	34.1	31.2
Corn beginning to tassel	47.5	45.3

Spacing of Corn.—In planting corn plenty of good sound seed should be used to insure a thick stand of healthy plants. This is desirable for two reasons: first, because birds and insects will destroy some; and, second, because the corn should be left thick in the drill. At the

Station here we are planting all of our general crop of corn on 3½ foot to 3 2-3 foot rows. This width enables us to cultivate all of the space between the rows with the double cultivator, whereas in wider rows there would be a strip six inches wide in the center of the "middles" unbroken. The number of plants on the land should be adjusted by thinning the drills rather than widening the rows. The following tables gives the results of spacing corn here:

TABLE No. 8.—Distance in Drills—March Plantings.

PLAT	Yield in bushels per acre 1913	Yield in bushels per acre 1914	Average yield in bushels
4 feet in drill	44.6	28.8	36.7
3 feet in drill	56.6	30.4	43.5
2 feet in drill	57.7	33.6	45.7
1 foot in drill	60.6	35.2	47.9

TABLE No. 9.—Distance in Drills—June Plantings.

PLAT	Yield in bushels per acre 1913	Yield in bushels per acre 1914	Average yield in bushels
4 feet in drill	23.7	25.7	24.7
3 feet in drill	29.6	28	28.8
2 feet in drill	28.8	28.2	28.5
1 foot in drill	23.7	30.1	26.9

In all of the above plats the rows were four feet apart. On account of the exceptionally dry July in 1914, the early plantings were materially injured and their yields were low.

TABLE No. 10.—Suckering Corn, 1910.

When Suckered	Cost of labor for suckering one acre	Yield in bushels per acre
Suckered 4 feet high	$.96	29.5
Suckered 6 feet high	$.96	29.4
Unsuckered		37.8

TABLE No. 11.—Suckering Corn, 1912.

When Suckered	Cost of labor for suckering one acre	Yield in bushels one acre
Suckered 4 feet high	$1.00	38.5
Suckered 6 feet high	$1.00	38
Unsuckered		40.5

Pulling the suckers from corn has never given us any increase in yields. The expense of doing this work should be put into better and more frequent cultivations.

TABLE No. 12.—Increased Yield from Manure.

	Average annual yield per acre in bushels—3 years
Not manured	27
10 tons of manure applied in 1911	37.5

The manure was added in the spring of 1911, and the increase was just as much in 1914 as it was in 1911. On one of our fields manured seven years ago, there is still a good increase in yield.

CORN AS A SILAGE CROP.

The principal silage crop in all parts of the country is corn. It is one of the best and the cheapest crops for this purpose that can be grown. With proper machinery for handling, the cost of putting this crop into the silo is very small. The keeping qualities of corn silage in the silo are better than of other crops, such as cowpeas, Johnson grass, sorghum, and others that we have tested.

Variety to Plant.—The variety that gives the largest tonnage per acre and has the highest percentage of grain is the most valuable to plant. For three years this Station has been testing varieties of corn for ensilage. The first test was made in 1912. The most promising varieties for large silage yields in the variety test for grain the previous year were selected, and some varieties that were advertised by dealers as ensilage corns were also included. The following table gives the results of the test:

TABLE No. 13.—Ensilage Corn Variety Test, 1912.

Name of Variety	Date of planting	Yield in tons per acre
Mosby	May 28	6.5
St. Charles	May 28	6.8
Eureka	May 28	6.3
Cock's Ensilage	May 28	6.7
Goliad	May 28	8.2

For 1913 and 1914 Mosby and Goliad were tested, the other varieties having been dropped from the experiment.

TABLE No. 14.—Ensilage Corn Variety Test, 1913 and 1914.

Name of Variety	Yield in tons per acre 1913	Yield in tons per acre 1914
Mosby	7.9	6.8
Goliad	10.9	10.2

In 1913 there was more corn of the Goliad variety than could be put into the silo. After this had matured, 75 bushels of ear corn per acre were gathered. In 1914 an average of 65.6 bushels of ear corn per acre were gathered from the Goliad corn, which was not used for silage.

Time to Plant.—In Mississippi ensilage corn can be planted any time from March 15 to July 1, but at the Station we prefer to plant about June 1, for the two reasons stated before: namely, first, the crop will mature for silage and be ready to put into the silo at a time when the farm labor is not busy with other work, and, second, we prefer to grow ensilage corn on land that has plenty of vegetable matter in it. To get vegetable matter in the soil we are rotating our ensilage corn with crimson clover. The clover is planted in the fall as soon as possible after the corn is off and a seed bed with plenty of moisture has been prepared. The clover grows up early in the spring and is ready to be plowed under about the first week in May.

Preparation of the Soil.—After the clover is well turned under, the land is left until after a rain when it is thoroughly pulverized with a disk harrow. Again at planting time the land is harrowed and the corn is planted on the level in drills 3½ feet apart. If there has been no clover plowed under, the preparation should be the same as for other corn crops.

Cultivation.—The cultivation should also be the same as for other corn crops. Where the rows are 3½ feet apart, the plants can be

thinned to any distance from 12 to 24 inches, depending on the fertility of the soil. If the soil is rich enough to produce 50 bushels of corn per acre, the plants ought to be about 12 inches apart in the drill. On land producing 25 bushels per acre, silage corn should be thinned from 18 to 24 inches.

The amount of silage from an acre of corn depends both on the fertility of the soil and the variety of corn grown. From our experience we figure that where the average variety of corn is planted, the results will be approximately as follows:

Soils Capable of Producing	Will Yield for Silage
20 to 30 bushels of corn	3½ to 5 tons per acre
30 to 40 bushels of corn	5 to 7 tons per acre
40 to 50 bushels of corn	7 to 9 tons per acre
50 to 60 bushels of corn	9 to 10½ tons per acre
60 to 70 bushels of corn	10½ to 12 tons per acre

Proper Time to Harvest.—The crop should be put into the silo at the time when it has stored up all the food ingredients and dry matter possible without becoming too dry. This is about when the kernels of the ear have become glazed and are fairly hard. A good rule to follow is to put the corn into the silo when the fodder is ready for pulling.

Cost of Growing and Putting into the Silo.—For three years the average cost per ton of silage at this Station has been $1.92. This includes everything from the rent on the land up until the silage is in the silo. Every thing was charged against the crop just as if the work had been done by hired teams and machinery.

HOLLY SPRINGS BRANCH EXPERIMENT STATION

FOUR YEARS' RESULTS.

By C. T. Ames.

TABLE No. 15.—Variety Test with Corn.—Dates of Plantings.

	April 10, 1908	May 17, 1912	April 3, 1913	May 14, 1914	June 18, 1914	Total average
		Bushels	Bushels	Bushels	Bushels	Bushels
1. Rockdale		54	36.7	60.8	37.0	47.1
2. Vardaman's stooling Variety			57.8	79	53.7	63.1
3. New Era				73.9	45.5	59.7
4. Davis' Poor Land Corn		54.6	49.8	75	50.2	57.4
5. Hastings' Prolific		51.2	47.1	77.5	47	57.7
6. Tenn. Red Cob		52.0		80.5	50.2	60.9
7. Florida Flint		53.4	39.6	74.7	38.4	51.2
8. North Carolina Prolific	68.8		48	78		64.9
9. Cockes' Prolific	70.5	51.2	55.9	87	48.7	62.6
10. Batt's 4 Ear		58.3	52	67	45.9	55.8
11. Mosby (from Rhodes)				83.3	43.3	63.5
12. Boone County White	51.3	45.5	47.1	65.5	41	50
13. Leaming			30.5	54.4	34	39.6
14. Mosby (Station)	60.8	54	43	75.5	53.5	57.3
15. Jones' Prolific			49.4	92.2	48.1	63.2
16. Munson		57.9	47.1	73	50.3	57
17. E—1		56.2	49.4			52.8
18. Marlboro	66	63				64.5
19. Alexander 6 Ear	66.6					

Remarks.—All plats one row each, repeated several times. In no instance was less than 1-20 acre planted to any one variety. All plantings were made on brown loam valley land.

Note.—Two plantings were made in 1914: One May 14, after a cutting of alfalfa was removed from the soil; the other planting, June 18, after oats were harvested.

Seasons the past year extremely dry.

TREATMENT FOR WEEVILS IN STORED GRAIN.*

"Carbon bisulphide, commonly called 'High Life,' is the standard remedy for all forms of insects that attack stored corn and peas. It is the simplest, most efficient and least expensive remedy for all insects that affect stored grain and other stored products. It is a colorless liquid with a strong odor which soon disappears. It vaporizes rapidly, forming a gas that is heavier than air. This gas settles down into the grain and displaces the air. It is a deadly poison and all insect life will soon be killed. Many people have obtained poor results from using carbon bisulphide simply because the room in which the grain was fumigated was not air tight or because not enough carbon bisulphide was used for the dimensions of the room.

"Where to Fumigate.—It is absolutely essential that the grain or other products to be fumigated be placed in a tightly closed room or vessel. Small amounts can be treated in barrels or tight boxes. The gas is heavier than air. If there are cracks or knot holes in the floor or sides of the room or vessel the gas will flow out like so much water. A barrel, bin, or other vessel with an open top may be used if the sides and bottom are air tight by placing blankets or canvas tightly over the top of the grain. It is waste of time and material to try to fumigate in an open crib.

"When to Fumigate.—Select a warm day. Never fumigate when the temperature is below 60 degrees Fahrenheit. On warm days the insects are active and are more readily killed by the gas. On cold days they are inactive, breathe but little, and the gas is not likely to be effective.

"Amount to Use.—For every 1,000 cubic feet of space use at least three pounds (or about three pints) of carbon bisulphide. If the room is not air tight a much larger amount may be necessary. There is no danger of using too much. For a tight barrel about two ounces (or a small cupful) of carbon bisulphide will generally give good results, if a blanket is placed securely over the top.

"How to Use.—Carbon bisulphide may be poured directly upon the grain or seed without injuring it for planting or feeding purposes. Sometimes shallow pans or other vessels are placed on top of the grain and the carbon bisulphide is poured into these vessels.

"Cost.—Carbon bisulphide can usually be purchased in quantities of fifty pounds or more for about ten cents a pound. It retails in small cans at about thirty cents a pound. It will pay most farmers to purchase it in fifty pound iron drums.

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*Prepared by Prof. R. W. Harned, Entomologist.

"Caution.—Carbon bisulphide is highly explosive and no form of fire should be brought near the place being fumigated. A lighted match, cigar, or lantern brought near the room while the fumigation is in progress would be very dangerous. The gas is also poisonous and as little as possible should be breathed. After applying the carbon bisulphide the operator should immediately leave the room. Care should be taken that no cats, dogs, or live stock are fastened up in the room with the gas.

"For any further information in regard to this substance address the Entomologist, Agricultural College, Mississippi."

Mississippi Agricultural Experiment Station

BULLETIN No. 171.

EXPERIMENTS WITH SMALL GRAINS

By J. R. RICKS.
AGRICULTURAL COLLEGE, MISSISSIPPI.
JANUARY, 1915.

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*In co-operation with U. S. Department of Agriculture.

EXPERIMENTS WITH SMALL GRAINS

In this bulletin will be found reports of the results from experiments with small grains from 1910 to 1914 inclusive. These include variety testing, rates of seeding, times of seeding, methods of seeding, and fertilizers. Treatments for diseases and insects are also given.

Since the small grains can be grown on all the soil types of the State cheaply, and as there is every reason to believe that the price will be high for the next few years, and in view of the low price of cotton, it seems that the growing of more of these grain crops and less cotton will be a good business proposition.

THE WEATHER.

TABLE 1.—Rainfall for Four Years.

MONTH.	1911.	1912.	1913.	1914.
January	5.49	4 90	7.74	1.05
February	3.75	2.91	7.80	4.22
March	1.45	9.41	6.16	6.19
April	10.07	13.20	2.53	5.46
May	1.92	4.68	4.12	2.15
June	5.88	6.95	1.79	5.06
July	6.24	6.77	3.58	.85
August	5.10	7.47	2.09	7.37
September	.20	5.05	7.93	7.10
October	2.18	5.20	2.71	2.00
November	4.28	1.00	2.63	3.00
December	11.83	8.96	3.72	6.47
Total	58.37	76.50	52.82	50.93

The annual average rainfall for this place for a period of ten years was 52 inches.

TABLE 2.—Variety Test of Oats.

VARIETY.	1910. Yield in bushels per acre.	1911. Yield in bushels per acre.	1912. Yield in bushels per acre.	1914. Yield in bushels per acre.
Appler	42	47	34.2	36.4
Bancroft	48	45.5	34	35
Red Rust Proof	50	48.3	39	42.6
Burt	42	39	33	36.2
Virginia Gray	43	38.6	34	35.4
Fulgham		37	35	36.7
Hastings' Hundred Bushels		40	35.5	37
Ninety Day		35	30	33

OATS.

As with corn, accurate records have been kept on the cost of producing oats on all experimental plats as well as the general crop, which consists of about 150 to 200 acres. Our experience shows that oats is undoubtedly the cheapest grain crop that can be grown. On soils producing 40 to 50 bushels per acre, the cost has been from 12 to 15 cents per bushel. On land producing from 20 to 25 bushels, the cost runs from 25 to 30 cents per bushel.

In addition to the cheapness with which the oat crop can be produced, the soil can be utilized for other crops. Cowpeas and soy beans are the best crops to come after oats on thin land. The average yield of peavine hay after oats on upland here has been 1½ tons of dry hay. Lespedeza also gives good results after oats. The seed of this crop, however, are planted early in the spring on the oat field and are harrowed in before the oats are large enough to be injured by the harrow.

The planting of oats on land infested with Johnson grass has given us the best combination so far as a money crop is concerned. In one test (1913), we got 47.6 bushels of oats and 2½ tons of Johnson grass hay per acre. In 1914, the test included oats and red clover on Johnson grass land. The yield was 53 bushels of oats and a ton of oat straw and clover hay per acre. In addition, 2 tons of Johnson grass and clover hay were cut per acre. Had the rainfall been sufficient in July, the

yield of hay would have been much better. In addition to the grain and the hay, we have gotten an average of one ton of straw, which is baled and used for cattle feeding. Experiments show that a ton of oat straw when properly cured is worth $6.00 for feeding. The number of cuttings of Johnson grass after oats is usually three, although we frequently get four cuttings in one season.

Preparation of Soil and Planting.—Good preparation is just as necessary and as profitable for oats as for the cultivated crops. In 1912, the yield from a plat of land which had had no preparation and on which the seed were covered with a disk harrow, was 19½ bushels per acre while a plat of the same soil which was thoroughly broken and harrowed, the seed being covered with a disk harrow, yielded 28.9 bushels. These plats were on oat stubble land that had grown nothing since the oats were cut off. On a plat of the same character of soil in the same field on which peavines had been grown after the oats, yielding 1¼ tons per acre, oats were planted without any preparation of the soil, the seed being disked under as before. . The yield per acre from this plat was 26¼ bushels while from another plat of pea stubble which had been well prepared the yield was 36½ bushels per acre. These plantings were made October 10.

Fall planting of oats has always given us much better results than spring planting. The average yields for two years for different times of planting are as follows: October plantings, 36½ bushels; January plantings, 25 bushels; and March 1st plantings, 16 2-3 bushels. These tests were made on loam land of medium fertility, and the soil was given good preparation in each instance. The variety of oats used was the Red Rust Proof, which has given us the best yields on all fall plantings. This variety, however, is not as good for spring planting as the Burt and other varieties which are suited for spring planting.

The method of planting oats determines, to a large extent, the yield. In 1911, a test was made of five methods of seeding oats on land where a crop of cowpeas had been harvested for hay. They were as follows:

(1). The oats were sown broadcast on unbroken land and covered about two inches deep with a small turning plow, and the surface was smoothed with a harrow. The oats were slow in coming up to a stand, but finally a good stand was secured.

(2). The seed were sown broadcast by hand on unbroken land and covered with a disk harrow and a smoothing harrow. A good stand was secured but very uneven as some plants came up ahead of others, there being some as late as three weeks after the first plants were up. This uneveness remained throughout the growing season, and at the time of harvesting there was quite a noticeable difference in the size of the stalks as well as the seed heads.

(3). The land was well broken and harrowed, and the seed were sown broadcast by hand and covered with a disk harrow. The plants germinated and grew off very much as in Number 2, but somewhat better.

(4). The land was well broken and harrowed, and the seed were put in with a grain drill. The plants all came to a stand early and grew

evenly. There was a marked difference in the looks of this plat and Numbers 2 and 3. There were but few dwarfed plants in this plat. The seed were all put in the same depth and the germination was good.

(5). The land was well broken and harrowed, and the seed were put in by what is known as the open furrow system. The plants came up and grew off in this plat very much as in Number 4.

The yields were as follows:

TABLE 3.—Methods of Seeding, 1911.

Plat.	Date of planting.	Amount of seed per acre.	Stand secured.	Approximate percentage winter killed.	Yield in bushels per acre.
1	Oct. 10	2 bushels	Good	20 per cent.	17
2	Oct. 10	2 bushels	Good	25 per cent.	14
3	Oct 10	2 bushels	Good	25 percent	19
4	Oct. 10	1¾ bushels	Good	2 per cent.	31
5	Oct. 10	1¾ bushels	Good	2 per cent.	29

During the winter of 1911-12, the freezes were severe enough to kill a goodly percentage of early fall plantings and practically all of the plantings after November 1, where the grain drill or the open furrow was not used.

In the fall of 1912, the same experiment as is shown in Table 3 was again tested out and the results were as follows:

TABLE 4.—Methods of Seeding, 1912.

Plat.	Date of planting.	Amount of seed per acre.	Stand secured.	Approximate percentage of winter killed.	Yield in bushels per acre.
1	Oct. 5	2 bushels	Good	2 per cent.	24
2	Oct. 5	2 bushels	Good	5 per cent.	18.9
3	Oct. 5	2 bushels	Good	5 per cent.	26.6
4	Oct. 5	1¾ bushels	Good		39.5
5	Oct. 5	1¾ bushels	Good		37

There were no winter killed plants in plats 4 and 5. We never had any trouble from winter killing where the oats were planted with a grain drill.

While we recommend 2 to 2½ bushels of seed to the acre when broadcasted and 1½ to 2 bushels when planted with a grain drill, we have obtained larger yields in a test where more seed per acre were used. See Table 5.

TABLE 5.—Rates of Seeding, 1912.

VARIETY	Amount of seed per acre.	Date planted.	Yield in bushels per acre.
Red Rust Proof	6 pecks	September 28	25
Red Rust Proof	8 pecks	September 28	34
Red Rust Proof	10 pecks	September 28	35
Red Rust Proof	12 pecks	September 28	38

It will be noted that this is only a one-year test, and this particular season, because of plenty of moisture, the heavy seeding did not suffer.

Fertilizers.—The fertilizing of oats should be done only when it is impossible to fit the crop into a rotation where there are legumes. We have gotten some fairly good results where 300 pounds of cotton-seed meal and 200 pounds of acid phosphate were used and then a top dressing of 75 to 100 pounds of nitrate of soda was made in the spring. Where we have been growing oats continuously for ten years in rotation with cowpeas, we are getting better results than where commercial fertilizers are used. In the brown loam and the sandy sections of the State, the fertilizers mentioned above give good results.

Time to Harvest.—Too often farmers let the oat crop get too ripe before harvesting, and the loss from shattering is more than usually suspected. The best stage for harvesting is when the seed begin to yellow, or when the oats are in the hard dough stage. At this time the crop contains all of the nutriment it will get; the seed as well as the straw will be more palatable; and the loss in harvesting is practically nothing.

DISEASES OF OATS.

Rust.—We have had very little trouble on account of this disease. It is a fungous disease and is more serious some years than others. In seasons of excessive moisture the attacks are very destructive. Inasmuch as there is no remedy for this disease, the best that can be done is to select as nearly as possible varieties that are rust-resistant. Red Rust Proof and Appler have proven the best varieties for us. Fall plantings are not as susceptible to this disease as are spring plantings.

Smut.—The last two seasons we have had considerable smut. The plants affected are usually shorter than the ones not affected.

Observations indicate that the disease is more destructive on oats tha have been sown broadcast by hand and the seed covered with a disl harrow. The number of weak plants is greater when the crop has beer planted in this manner than when planted with a grain drill. The formalin treatment as given for wheat smut on page 10 in this bulletin is the proper remedy for oat smut

TABLE 6.—Variety Test of Wheat.

VARIETY.	1910. Yield in bushels per acre.	1911. Yield in bushels per acre.	1912. Yield in bushels per acre.	1914. Yield in bushels per acre
Fultz Mediterranean	23	25	21	11.02
Currell's Prolific	24.89	25.5	20.9	11.8
Purple Straw	24.89	26	24	12.3
Fultz	22.94	25.7	22.6	14.5
Dietz Mediterranean	23.43	23	20	14.3
Lancaster	20.56	21.8	19.5	14
Golden Chaff	24.89	26	20.9	15.2
Red May	20.99	27	23	15.4
Klondike	26.94	23.6	23.6	15.4
Australian	20.23	22	21	17.9
Fulcaster	22.3	19.6	19	15.4
Leap's Prolific	21.32	19.9	20	16.9
Harper		20	19.6	
Harvest King		19.6	20.6	16.2
Red Wonder		23.5	22.4	
Stoner		20.7	20	

The growing of wheat in Mississippi can be made a very profitable business. Some of the essentials in profitable wheat growing are as follows:

Soils for Wheat.—A good wheat soil is one that is stiff and well drained, having plenty of vegetable matter in it. If possible to do so, there should be a crop of cowpeas or soy beans grown on the soil preceding the wheat crop. It is a hard matter to get either corn or cotton off the land and a good firm seed bed prepared in time for planting the wheat crop.

Preparation of the Soil.—A seed bed good enough to plant a garden is not too good for wheat. The soil should be well broken and harrowed some time before planting in order to allow the soil to settle, or firm down. A good rain will be much better for this, but if there is no rain, a heavy iron roller will do good work. Just before planting use a disk harrow and a smoothing harrow to pulverize the surface.

Planting.—In Mississippi the planting should be done about the first of November. A week earlier or a week later than this will be all right. If the crop is planted very much earlier than this, it is likely that it will grow too much, reach the booting stage, and be killed by a late spring freeze. We have gotten our best results at this Station from November 2nd plantings.

The best method of seeding is with a grain drill. More even and uniform stands are secured and the ripening is more uniform. The danger from winter killing is much less when the crop is planted with a grain drill. This method of seeding does not require as much seed as the broadcasting method, and the yields are usually much better.

Amount of Seed.—Our best results have been obtained where 1½ bushels of seed per acre were put with a grain drill. When broadcasting by hand, the best amount is two bushels per acre.

The depth of planting depends on how well the soil has been prepared. With good preparation and plenty of moisture, a depth of two inches gives us the best stands.

Fertilizers for Wheat.—It is a hard matter to say which fertilizers will be best for wheat since a fertilizer that is good for one soil type may not be good for other types. On our stiff soils here at the Station, we get practically no benefit from the use of commercial fertilizers. However, in sections such as the brown loam, good results are obtained from the use of 300 pounds of cottonseed meal and 200 pounds of acid phosphate. The best plan is to plant on fertile soils, the fertility of which has been kept up by a good system of crop rotation.

DISEASES OF WHEAT.

Rust.—Probably the wheat rust causes more damage to wheat in Mississippi than all of the other diseases. Here at the Station we have had considerable trouble with this disease. In wet seasons the

disease is much worse than in dry seasons. It was particularly bad here in the spring of 1913 and again in 1914 on account of a continued rainfall late in the spring. There is no remedy for this disease. Some varieties seem to resist the disease more than others. Usually the earlier varieties are less susceptible.

Smuts of Wheat.—There are two kinds of smut attacking wheat, the stinking smut and the loose smut. The losses from these diseases, however, are very small in this State.

The stinking smut attacks the kernels. The disease can be easily prevented by treating the seed with a formalin solution. This solution is made as follows: To 40 gallons of water pour one pint of formalin, full strength, of 40 per cent formaldehyde, and thoroughly mix by stirring. There are two methods of treating the seed with this solution, sprinkling and dipping. If the seed are to be sprinkled, they should be put in a pile on a floor or in a wagon body and the solution should be sprinkled on the seed until they are thoroughly wet, a gallon of solution to a bushel of seed being sufficient. In dipping, put the seed in a sack and immerse in the solution and let them remain until they are wet through. After the surplus solution has been drained out, the seed are ready for planting or they may be dried and stored away.

The loose smut attacks both the kernel and the chaff. This smut matures earlier than the stinking smut, and usually attacks the wheat when it is in bloom. The treatment for loose smut is much more difficult than for the stinking smut. The seed must be cleaned and soaked in cold water for several hours, and then they are put in bags and soaked in water that has a temperature of 129 degrees Fahrenheit for four or five minutes. Since this treatment requires so much accuracy and very often injures a large percentage of the seed, it is much better to select seed from patches or fields where no smut is found.

INSECTS.

There is practically no damage to wheat in Mississippi from insects. We frequently have more or less damage to the stored grain from some of the moths the weevils. Carbon bisulphide is the best remedy for these insects, and directions for using this chemical are given on last page of this bulletin.

RYE.

While rye gives fairly good yields of grain, it is doubtful if it will ever be grown to any extent for grain in this State. The average yield of grain here for three years was 23½ bushels per acre. It will resist the freezes better than oats and will mature seed ten days earlier. The greatest value we get from rye is in the winter and spring grazing it gives.

BARLEY.

Barley is grown less in this State than any of the small grains. n average yield here for three years was 17 bushels of grain per acre. ike rye, its chief value is in the grazing obtained from the crop.

SPELTZ, OR EMMER.

This is a grain crop resembling rye or barley while growing but aving larger seed. It is claimed that speltz yields much better than ats. In the only test that we have made, the yield was 28.5 bushels of eed per acre on spring planting. This is better than the average yield rom spring planted oats. It grows tall and will yield a large quantity f hay. It is an unusually hardy plant and is not affected by dry veather as much as other small grains. This crop will probably in ime become one of our important grain crops.

TREATMENT FOR WEEVILS IN STORED GRAIN.*

"Carbon bisulphide, commonly called 'High Life,' is the standard emedy for all forms of insects that attack stored corn and peas. It is he simplest, most efficient and least expensive remedy for all insects hat affect stored grain and other stored products. It is a colorless quid with a strong odor which soon disappears. It vaporizes rapidly orming a gas that is heavier than air. This gas settles down into the rain and displaces the air. It is a deadly poison and all insect life will oon be killed. Many people have obtained poor results from using arbon bisulphide simply because the room in which the grain was fumi- ated was not air tight or because not enough carbon bisulphide was sed for the dimensions of the room.

"Where to Fumigate.—It is absolutely essential that the grain or ther products to be fumigated be placed in a tightly closed room or essel. Small amounts can be treated in barrels or tight boxes. The as is heavier than air. If there are cracks or knot holes in the floor or ides of the room or vessel the gas will flow out like so much water. A arrel, bin, or other vessel with an open top may be used if the sides and ottom are air tight by placing blankets or canvas tightly over the top f the grain. It is a waste of time and material to try to fumigate in n open crib.

"When to Fumigate.—Select a warm day. Never fumigate when he temperature is below 60 degrees Fahrenheit. On warm days the nsects are active and are more readily killed by the gas. On cold days hey are inactive, breathe but little, and the gas is not likely to be ffective.

"Amount to Use.—For every 1,000 cubic feet of space use at least hree pounds (or about three pints) of carbon bisulphide. If the room is ot air tight a much larger amount may be necessary. There is no anger of using too much. For a tight barrel about two ounces (or a

small cupful) of carbon bisulphide will generally give good results, if blanket is placed securely over the top.

"How to Use.—Carbon bisulphide may be poured directly upo the grain or seed without injuring it for planting or feeding purpose Sometimes shallow pans or other vessels are placed on top of the grai and the carbon bisulphide is poured into these vessels.

"Cost.—Carbon bisulphide can usually be purchased in quantitie of fifty pounds or more for about ten cents a pound. It retails in sma cans at about thirty cents a pound. It will pay most farmers to pu chase it in fifty-pound iron drums.

"Caution.—Carbon bisulphide is highly explosive and no form c fire should be brought near the place being fumigated. A lighte match, cigar, or lantern brought near the room while the fumigation i in progress would be very dangerous. The gas is also poisonous an as little as possible should be breathed. After applying the carbo bisulphide the operator should immediately leave the room. Car should be taken that no cats, dogs, or live stock are fastened up i the room with the gas.

"For any further information in regard to this substance, addres the Entomologist, Agricultural College, Mississippi."

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*Prepared by Prof. R. W. Harned, Entomologist.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

BULLETIN No. 172

FORAGE CROPS

By J. R. RICKS

AGRICULTURAL COLLEGE, MISSISSIPPI
JANUARY, 1915

TELL FARMER, PRINTER, MERIDIAN

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* In co-operation with U. S. Department of Agriculture.

FORAGE CROPS

By J. R. Ricks.

INTRODUCTION.

On account of the uncertainty of cotton growing in the State and still more the uncertain market conditions for this product, a large number of cotton farmers are turning their attention to live stock, and for profitable live stock farming it is necessary to grow an abundance of forage crops and to grow them cheaply. On crops like Johnson grass and others yielding as much, the cost per ton at the Mississippi Experiment Station is usually around $4.00 under ordinary conditions.

A forage crop may be defined as a crop that may be used as hay, as a soiling crop, as silage, or as a grazing crop. In this bulletin the subject matter is treated under three general headings, as follows:

1. Grass Crops.
2. Leguminous Crops.
3. Miscellaneous Crops.

For the past four years this Station has been experimenting with the crops mentioned in this bulletin to determine in a comparative way their yields, the cost of growing, and their suitability for feeding or grazing.

The various crops have been discussed somewhat in detail, and the merits or demerits of each have been mentioned.

JOHNSON GRASS.

Johnson grass is one of the most valuable hay grasses in localities suited to its growth. It grows best on the heavy lime soils in the northeast prairie region of Mississippi and does fairly well on other stiff rich soils of the State where there is a large percentage of lime. On account of its being perennial the only expense in growing it for hay is the rent on the land and the harvesting. On soils where it grows well, from 3 to 5 cuttings may be had, which will yield from 3 to 5 tons of dry hay per acre.

In preparing a seed bed for planting the seed of Johnson grass it is very necessary to have a very finely pulverized surface in which

to put the seed. It is very difficult to secure a stand from the seed without a proper seed bed and good moisture conditions. In a test of different rates of seeding we secured our best results from one bushel of seed per acre. Plantings made the first part of April have given us the best results. In case poor stands are secured, the cultivation of the field will cause the grass to spread, and in a few seasons it is possible to have a perfect stand.

A Johnson grass meadow needs no annual treatment. Once in every three or four years the meadow should be thoroughly plowed and smoothed down with harrows. It is better to do this work in the winter or early spring.

It is not advisable to plant Johnson grass on clean fields; yet when it is once started it can be made a profitable crop.

FIG. 1.—JOHNSON GRASS AFTER OATS—READY TO BE CUT SECOND TIME.

One of the most profitable ways of handling a Johnson grass meadow is to break it after the last cutting of hay in the fall and sow a crop of oats on it. The oats are ready to be harvested in the spring before the Johnson grass has made much growth. However, the growth will be large enough for some of it to be cut by the binder,

and this mixture of grass and straw after threshing makes a fairly good rough cattle feed. In 1913 on one of the Station fields this combination gave a yield of 46.7 bushels of oats with some grass, which was cut with the oats and baled with the straw after threshing. The first cutting of Johnson grass from the land gave a yield of 2900 pounds of dry hay per acre. The second cutting yielded 2200 pounds of dry hay per acre. On account of the exceedingly dry weather during the late summer we did not get a third cutting. In 1914 a mixture of oats and red clover was planted in a field heavily infested with Johnson grass. The yield of oats was 53 bushels per acre; and the mixture of straw, red clover, and Johnson grass averaged one ton per acre. This mixture was baled; farm stock of all kinds eat it very readily. After the oats were harvested, there were only two cuttings of Johnson grass obtained, which gave a yield of 1½ tons per acre. Again the dry weather during July and August kept us from getting a third cutting. We kept accurate data on the growing of these crops. The following are the results for one acre:

Breaking the land	$ 1.00
Harrowing	.50
3 bushels of seed oats	2.25
Planting with drill	.50
Harvesting with binder	.50
Hauling, threshing, and sacking	2.00
Bailing one ton of mixed straw and clover	1.50
Cutting, baling, and hauling 1½ tons of hay	4.50
Total cost	$12.75

VALUE OF CROPS.

53 bushels of oats @ 60 cents	$31.80
1 ton of mixed straw and clover	6.00
1½ tons of Johnson grass and clover hay	15.00
Total	$52.80
Profit on one acre	$40.05

If properly handled, the saving of a hay crop need not be expensive. During July, August, or September if the weather happens to be very dry, it is unnecessary to put it into stacks. After two or

three days in the windrow the hay may be carried to the press by means of "bull rakes," or buck rakes, such as are seen in illustration number 3. We have baled Johnson grass from the windrow with fine success here for a number of seasons. Of course, the bales need not be packed quite as hard as if the hay had gone through the "heat" and should not be closely stacked afterwards, but should be so stacked that there will be air spaces around them. The result will be a better colored and cheaper hay.

FIG. 2.—THIRD CUTTING OF JOHNSON GRASS AFTER OATS.

There is one objection to planting oats in Johnson grass meadows; and that is, the two crops draw so heavily on the fertility of the soil that in time it will not give very good returns. In fertile valleys and on the black prairie soils where Johnson grass grows best, this combination will grow for a number of years without any noticeable decrease in the yields. And, too, on stock farms there is plenty of manure, and an application to the meadow of a few tons per acre every few years will keep up the fertility. This rotation has been run continuously on one of the Johnson grass meadows here at the Station for ten years without any treatment, and the yields are apparently as good now as when the first crop was grown. This meadow, however, is in a very fertile valley.

Planting melilotus in a Johnson grass meadow improves the quality of hay as well as increases the yield. Melilotus will grow up early in the spring, and a cutting may be had from it before the Johnson grass has made much growth. The subsequent cuttings will be a mixture of the two. While Johnson grass hay looks a little coarse, stock eat it readily and chemical analysis shows it to be richer in protein than timothy.

The proper time to cut Johnson grass for hay is when it is just heading out.

FIG. 3.—"BUCK RAKE" METHOD OF GETTING HAY TO THE PRESS OR STACK.

It is not an easy matter to eradicate Johnson grass thoroughly, but when the work is gone about in the proper manner, it can be done. Several shallow plowings in the fall and winter, leaving the land rough each time, will destroy a large part of it. By planting a clean cultured crop on the land the following season and again repeating the shallow plowings during the fall and winter, the grass will be practically destroyed.

Johnson grass is unsuited for permanent pasture purposes; in fact, pasturing is one of the methods that will help control it. By

continuous and close grazing for several seasons the grass can be partially controlled.

SUDAN GRASS.

Sudan is a new grass, having been grown in the United States only for the past few years. It promises to be the equal of Johnson grass both in yield and in feeding value. Because it is an annual, does not have big root stocks, and must be planted each spring, it will very probably become one of the principal hay crops of the State. The appearance of Sudan grass, both in the field and as a hay, is very much the same as Johnson grass. There is some difference in the color of the seed; the seed of Johnson grass being amber colored, whereas the seed of Sudan grass are straw colored. Other-

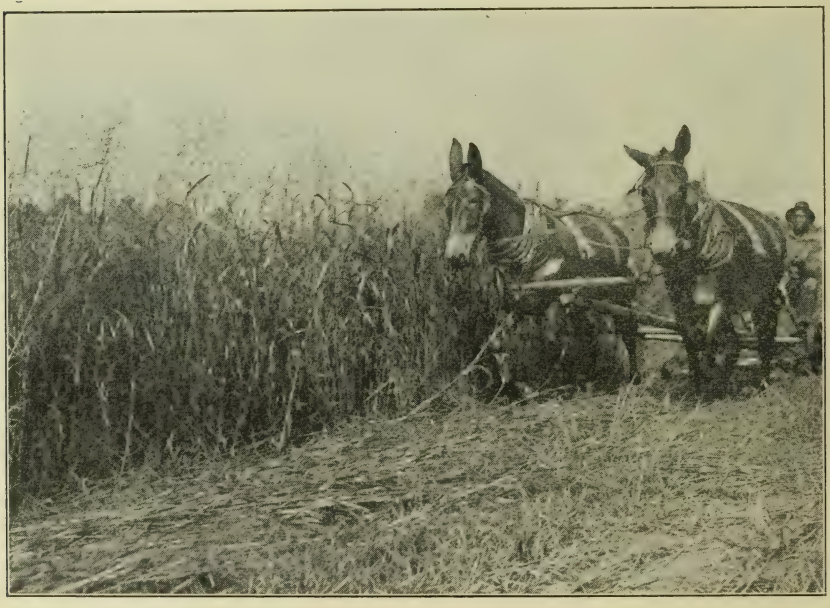

FIG. 4.—FIRST CUTTING OF SUDAN GRASS. IT WILL BE NOTED THAT THE GRASS IS A LITTLE TOO OLD TO MAKE THE BEST HAY.

wise the seed are very much the same, Sudan grass seed being a little larger than the seed of Johnson grass. Unlike Johnson grass, Sudan seems to do well on all sorts of soil. Our biggest yields have been obtained from stiff rich valley land.

Plantings may be made any time from March 15 until June 1 with good results. Our test includes earlier and later dates than

these, but the best yields were obtained from April 1 and April 15 plantings.

The following table gives the results from different times of planting:

Table No. 1.—Results from Planting Sudan Grass on Different Dates, 1913.

DATES OF PLANTINGS	Amount of Seed Planted	Number of Cuttings Obtained	Total Yield lbs. Hay per Acre
March 1st	20 lbs.	3	5730
March 15th	"	3	7500
April 1st	"	3	10750
April 15th	"	3	11150
May 1st	"	2	7200
May 15th	"	2	6900
June 1st	"	2	6100
June 15th	"	2	5250
July 1st	"	2	5150
July 15th	Too dry for seeding		
August 1st	" "	" "	
August 15th	20 lbs.	1	2900

As to the amount of seeding required to seed an acre, the following table indicates that 20 to 25 pounds per acre is the most economical:

Table No. 2.—Rates of Seeding Sudan Grass, 1913.

AMOUNT OF SEED PER ACRE	Total Yield lbs. Dry Hay per Acre
15 lbs.	3850
20 lbs.	4130
30 lbs.	4900
40 lbs.	5000

The planting for the above tests was made about May 15 on a soil of less fertility than that on which the test for different times of planting was made.

On account of rapid growth Sudan grass is unsuited for planting with legumes, such as cowpeas and soy beans. A mixture of Sudan grass and sweet clover will give good results. It requires about 90 to 100 days for cowpeas and soy beans to mature for hay. During this time the Sudan grass will need cutting from two to three times. In a test that was made here with Sudan grass, cowpeas, and soy bean mixtures in 1913, there was but little hay obtained from the legumes after the first cutting. The cowpeas and soy beans obtained in the first cutting did not amount to much because these

plants had had but about 60 days growth. The following table gives the results from these mixtures:

Table No. 3.—Legume Mixtures with Sudan Grass.

RATE OF SEEDING THE MIXTURE	Total Yield lbs. Dry Matter per Acre
12lbs. Sudan grass 60lbs. cowpeas	3800
20lbs. " " 60lbs. "	4750
12lbs. " " 40lbs. "	3600
12lbs. " " 60lbs. soy beans	3700
20lbs. " " 60lbs. " "	4750
12lbs. " " 40lbs. " "	4500

The time and method of cutting Sudan grass for hay are the same as for Johnson grass. The cutting should be made before the seed are formed or when the first heads begin to appear. It is possible to get three to four cuttings each season. The number of cuttings and the yield will depend on the fertility of the soil and the weather conditions.

BERMUDA GRASS.

Unlike Johnson grass and Sudan grass, Bermuda is not only a good hay, but also a good pasture grass. It is more profitable to handle this crop as a pasture proposition and plant one of the grasses mentioned above for hay. Bermuda grass should be the foundation for all permanent pastures in this State. When once set, it is not easily killed, and will furnish more grazing than any other grass that can be planted. So persistent and vigorous is its growth that very nearly a ton of hay may be cut from pastures which have been grazed all the summer.

There are two methods of propagating Bermuda grass, viz.: by the seed and by transplanting the roots. If the seed are used, a finely pulverized seed bed should be made, and the seed planted in April. About 6 pounds of seed per acre is enough to secure a stand in case a stand is to be had; it is a very difficult matter to get a good germination, especially on stiff soils. The seed should be broadcasted and covered with an iron roller. If covered with a harrow or some other implement of that kind, the covering might be too deep, in which case the seed would fail to germinate. Bermuda seed are usually high in price and very unreliable. It is, therefore, advisable to plant the sod, or roots. There are several methods of making these root plantings. The cheapest method is to plow and harrow the land, broad-

cast over it a few wagon loads of the roots cut in small tufts, and cover with a disk harrow. Other methods—such as digging holes three feet apart with a hoe and covering; and the plowing of small furrows and putting the sod in and covering—are expensive. The furrow method is better than digging the holes with a hoe.

The table below gives the cost of different methods of propagation:

Table No. 4.—Different Methods of Propagating Bermuda Grass.

METHODS	Kind of Stand Secured	Cost to Plant One Acre
Properly prepared and planted 6lbs. seed per acre	Very poor	$ 4.50
Properly prepared and sod covered with disk harrow	Fairly good	6.20
Properly prepared, manured, and sod covered with disk harrow	Fairly good	9.10
With hoe, holes 3 ft. apart and covered with hoe	Medium	13.20
Furrows 3 ft. apart and sod covered with hoe	Medium	9.50

The expense of planting an acre of Bermuda grass is rather high when every thing is figured in at a price of hiring it done. On the average farm, however, this expense need not necessarily be so much, since this can be made a "wet weather job" and the regular labor on the farm can do it. In our estimates in the above table, $ .80 per day was allowed for the men; $3.00 a day for a team and driver.

RED TOP, OR HERD'S GRASS.

In the tests we have made with Herd's grass, the results have been very good. This grass is suited better for pasture than for hay; however, it yields a hay of fair quality. It grows better on low moist soils than on uplands. It is a good grass for early spring grazing. A mixture of Herd's grass with alsike clover and orchard grass, both of which do well on moist soils, makes a valuable combination for either hay or pasture.

SORGHUM.

For large yields of forage there is no crop that will excel sorghum. It will grow well on all types of soil and is not as much affected by weather conditions as other cultivated crops. Sorghum is more valuable as a silage or a soiling crop than as a hay crop.

The greatest objection to growing it for hay is that it is difficult to cure, especially if the crop is late and is not cut till the weather is cool in the fall. If it is grown for hay at all, it should be planted early in order that it may ripen and be ready to cut in August.

As a silage crop sorghum will yield more and can be grown more cheaply than corn. While sorghum silage is not quite as good as corn silage, yet it is a valuable cheap succulent feed.

If sorghum is grown for hay, a mixture with cowpeas or soy beans gives excellent results. The yield of hay is increased and the quality improved.

Table No. 5.—Yield of Mixtures of Sorghum with Cowpeas and Soy Beans.

METHODS	Total Yield Tons Dry Hay per Acre
2½ bushels of sorghum broadcasted	3.5
2 bushels of sorghum and 1½ bushels of cowpeas broadcasted	4.75
2 bushels of sorghum and 1½ bushels of soy beans broadcasted	4.6

A heavy seeding broadcast gives a better hay than seeding in the drill. The stalks will be smaller and the crop less difficult to cure for hay. For a silage or soiling crop, the seed should be put in drills and the crop should be cultivated.

TEOSINTE.

Though it is impossible to grow a large amount of forage from teosinte, it is more difficult to harvest and cure than sorghum. The stalks grow larger than sorghum. In one of the tests made here, the crop was cut the first week in September and lay on the ground ten days before it was dry enough to put in the barn. Sorghum is a cheaper and more profitable crop than teosinte.

MILLET.

Millet is a valuable crop for quick growth. It is suited to a warm rich soil, and in the test made here we obtained three tons of dry hay per acre. In harvesting the crop of hay, it should be cut before the seed are ripe, especially if the hay is to be fed to horses. Just after the crop is "headed out" is a good time for harvesting.

SOME OTHER GRASSES TESTED.

Rhodes grass, rye grass, and orchard grass have also been tested. These grasses are better for pastures than for meadows. On rich

warm soil Rhodes grass will yield some very good hay. This grass grows better in the southern part of the State. A mixture of rye grass and bur clover or alsike clover gives good winter and early spring grazing.

ALFALFA.

Alfalfa is one of the most valuable of the leguminous plants for forage, both from the standpoint of yield and of feeding value. On land suited to its growth a normal yield of four to five tons per acre is obtained annually.

Soils for Alfalfa.—A deep well drained soil containing plenty of lime is necessary for the successful growing of alfalfa. This plant requires, in addition to large quantities of lime, plenty of phosphoric acid, magnesium, and potash. There are three sections in Mississippi where this plant grows well without the addition of these materials when the soils have been properly drained. These are the northeast prairie section, the central prairie section, and the "buckshot" soils of the Delta. As for the other sections of the State, it is necessary to add the materials that are deficient in the soil. Our circular on growing alfalfa at the Holly Springs Branch Experiment Station gives a successful method of growing it in the brown loam region. This circular may be had by writing the Director of the Experiment Station, Agricultural College, Miss.

Preparation of the Soil.—Better results are obtained when preparation begins several months before planting. The soil should be comparatively free from grass and weeds. To accomplish this the crop should be preceded by some clean cultured crop or some crop, such as cowpeas, planted thick which will completely cover the ground and prevent the growing of grass and weeds. It is often a good plan to plant nothing on the soil, but to keep it broken and harrowed through the summer before planting in the fall. Our results are just as good where the land grew a crop of cowpeas as where the land was kept bare and constantly plowed. In any case, the breaking of the soil must be done long enough before seeding to insure a good, firm, well pulverized seed bed. Good deep plowing where there is good drainage has given us as satisfactory results as subsoiling with dynamite or with a subsoil plow.

Table No. 6.—Deep Preparation in Fall of 1911.

HOW TREATED	First Cutting lbs. Dry Hay per Acre	Second Cutting lbs. Dry Hay per Acre	Third Cutting lbs. Dry Hay per Acre	Fourth Cutting lbs. Dry Hay per Acre	Total lbs. Dry Hay per Acre
Plowed 7 inches deep	2416	2100	1600	1390	7506
Subsoiled with plow 18 ins. deep	2390	2016	1560	1360	7326
Subsoiled with dynamite 18 to 24 inches deep	2350	2000	1580	1380	7310

In the above experiment good stands were secured on all of the plats, and the results as shown above are from cuttings made in 1913. In 1914, only four cuttings were secured, there being at least one cutting short on account of the extremely dry weather in July and the first week in August. The total yields were as follows: on the plowed plat the total yield was 8026 pounds; on the subsoiled plat, 8116 pounds; and on the dynamited plat, 8134 pounds.

Seeding and Inoculation.—Alfalfa will not do well in soils which do not contain certain bacteria which assist the plant in assimilating nitrogen. Where these bacteria are not present the soil must be inoculated before alfalfa can be successfully grown. The inoculation can be done by using the pure cultures, which may be obtained from the U. S. Department of Agriculture or purchased from the manufacturers. The seed are moistened with the solution containing the bacteria. The inoculation can also be done by using a few hundred pounds of soil from a field where alfalfa is growing. This soil is broadcasted over the field and mixed in the soil there with a harrow. Throughout the northeast prairie section where there is plenty of melilotus growing, inoculation is unnecessary since melilotus and alfalfa require the same bacteria for inoculation.

From 20 to 25 pounds of seed per acre have given us the best results. A smaller amount of seed will give a stand if the soil has been made into a perfect seed bed and the moisture conditions are right, but when one has gone to the expense of preparing the land, it is wise to use a few pounds extra in seeding to be sure of getting a proper stand. On the whole, fall seedings have given better results than spring seedings. Any time between September 1 and November 1 will do for planting. Spring plantings grow off so slowly that grass and weeds often interfere with the growth of the young crop, whereas fall plantings are so far ahead of the grass and weeds that there is no danger of the alfalfa being crowded out. Planting in the spring can be done from March 15 to April 15.

There are two methods of seeding alfalfa; namely, seeding with a drill and broadcasting. The drill is probably better in many respects, but unless the operator is careful and sees to it that the seed are properly put in, there is danger of covering them too deep. Broadcasting with a wheelbarrow seeder and covering with a corrugated iron roller has never failed to give us a fine stand, and this method is recommended for the farmer who cannot give the seeding his special attention.

Treatments for Alfalfa.—On the rich soils that are suited to alfalfa there is not much to be gained from manuring or liming before planting, as will be seen from the following:

Table No. 7.—Different Treatments of Alfalfa, 1912.

TREATMENT	First Cutting lbs. Dry Hay per Acre	Second Cutting lbs. Dry Hay per Acre	Third Cutting lbs. Dry Hay per Acre	Fourth Cutting lbs. Dry Hay per Acre	Total lbs. Dry Hay per Acre
10 tons manure per acre	2300	2000	1508	1490	7298
10 tons manure and 500 lbs. lime per acre	2350	2175	1700	1545	7770
500 lbs. lime per acre	2100	1980	1500	1390	6970
Check plat	2050	1900	1500	1380	6830

On soils that are not naturally suited to alfalfa, the treatments given in the above table will produce good results.

After the first year an annual disking of the alfalfa field is a paying proposition. The work is done with a common disk harrow, and the more thoroughly the work is done the better. We have tried different implements that are on the market under the name of alfalfa harrows, alfalfa renovators, etc., but none of them has been as satisfactory as the disk harrow. The disking, besides being a cultivation, has the effect of thickening the stand because the crowns of the alfalfa are split and throw more shoots. The spike tooth alfalfa harrow neither splits the crowns nor thoroughly cultivates the soil, requires more horse power to operate it than the round disk, and does not do as good work. If the cultivation with the harrow is done in the fall, it will give a good chance to thicken the stand by adding new seed, should it be necessary. This new seeding is sometimes a failure when the work of putting the seed in has not been properly done or the seed have been put in too late in the spring. Our results have been satisfactory when the work has been done in

October. Of course, this method is recommended only where there are thin patches. If the stand is thin over the whole field, it will probably be more economical to plow up the whole crop and plant the land to some clean cultured crop for a year before seeding again to alfalfa. It is a difficult matter to get the land in proper shape for fall planting when the crop has been plowed under in the fall. The young alfalfa does not seem to thrive, and so much of it dies that there is no stand left. This is probably caused by the soil becoming acid from the decay of the roots and other vegetable matter. We have had two failures out of three attempts to follow alfalfa with alfalfa. It is more profitable to follow the alfalfa with oats and follow the oats with a heavy seeding of cowpeas; then the soil will be ready for a new seeding of alfalfa.

ALSIKE CLOVER.

On account of its ability to thrive on wet lands, alsike clover is very valuable for planting on the low lands in pastures. It does not grow large enough to be of much value as a hay crop; however, on a very rich cultivated soil it will give a good yield of first-class hay. A mixture of alsike and Herd's grass makes an excellent combination for damp places in a permanent pasture.

BUR CLOVER.

Bur clover is valuable only as a pasture plant. It should be planted in September or October. The plant matures seed about the first of May and dies down, and for this reason is an excellent plant in a Bermuda pasture. The seed, matured in the spring, germinate in the fall, and in this way bur clover reseeds itself.

CRIMSON CLOVER.

The advantage in growing crimson clover for hay, grazing, or soil improvement is that it makes its growth early in the spring and is off the land in time to plant regular cultivated crops. For this reason crimson clover can be used in rotation with crops to which other clovers are unsuited.

Crimson clover makes a valuable hay if cut at the proper time and properly cured. The trouble we find in making hay out of it is that it is ready to cut before hot weather so it is difficult to cure properly a heavy growth of this crop, especially if the weather is not good. The proper time for cutting crimson clover hay is when

it is in full bloom. Care should be taken that none of the heads are too old, as the hairs on the ripened stems and heads are likely to cause trouble when the hay is fed to horses or mules.

As a crop for soil improvement, crimson clover is one of the most valuable crops that can be grown in the State. It grows well on all types of soil when they have once been inoculated and the moisture conditions are right. It will not grow on wet seepy soils or on soils that are extremely sour. On rich soils the crop will often yield as much as 10 to 12 tons of green matter per acre. Our best yield is 10.2 tons.

FIG. 5.—FIELD OF CRIMSON CLOVER.

In the preparation of a seed bed for crimson clover, it is very necessary to have a well pulverized surface with a firm, compact subsurface.

INOCULATION.—If the soil has never been inoculated, it will be necessary to inoculate it before attempting to grow crimson clover. This can be done by harrowing into the soil a few hundred pounds of soil from some field where the clover has been growing, or by

treating the seed with cultures. We have had good results here where large quantities of stable manure were used, but it is possible that some of the bacteria necessary for inoculation were either in the manure or in the soil, although the soil had seemingly never had a chance to become inoculated.

The seeding of crimson clover may be done in a number of ways, but in our work the most successful method is broadcasting with a wheelbarrow seeder and covering with a corrugated iron roller. If the soil has been properly prepared, 15 pounds of seed per acre is about the right rate of seeding. The seeding may be done either in September or in October, and should be done as soon after a rain as the soil will permit of being worked.

At this Station crimson clover has been grown in rotation with ensilage corn for a number of years, the crimson clover being plowed under each time. The clover is plowed under when in full bloom, which is usually about the first of May. The land is put in shape for planting any time after this when a good rain has fallen. The corn is planted about June 1, and is ready for the silo about September 10. As soon as the corn is harvested, the land is thoroughly prepared for the clover, which is planted whenever there is plenty of moisture in the soil, but not later than October.

RED CLOVER.

Red clover grows well on all of the rich stiff soils of the State containing plenty of lime. The results here with red clover have been good. When planted alone red clover has yielded as high as 2¾ tons of dry hay per acre. It has also given fine results when planted with oats or wheat. In the harvesting of the grain crops, the clover is cut and bundled up with the grain, and, after threshing, the mixture of straw and clover is baled and fed to cattle with excellent results. After the crop of grain and clover has been harvested, we frequently get two more cuttings of clover hay.

On a well prepared seed bed, 10 to 12 pounds of seed per acre will be required for a good stand. If the clover is planted in a mixture with oats, 8 pounds of seed per acre is about the right amount. The

seeding should be done either in September or in October, preferably in September.

LESPEDEZA (JAPAN CLOVER).

Lespedeza grows well on all of the different types of soil but seems to do better on the loam soils. It grows wild in all sections of the State. When a rich soil has been well prepared and planted in lespedeza, a yield of 2 to 2½ tons per acre is often obtained. The hay is readily eaten by farm animals and is equal in feeding value to alfalfa. As a grazing crop, lespedeza is exceedingly valuable.

The planting of 15 pounds of seed per acre on a well prepared seed bed the latter part of February or early in March will give a good stand. Lespedeza planted on oats which were seeded in the fall gives good results. An inexpensive and reliable method of doing this is to broadcast the seed over the oat field and cover them with a smoothing harrow, its teeth set slanting backwards so that the oats will not be injured. The lespedeza does not make very much growth until the oats are harvested, and the harvesting will not injure the lespedeza.

Lespedeza in Johnson grass meadows has not given us very good results. The lespedeza seems partially, and in places almost wholly, to crowd out the Johnson grass.

MELILOTUS (SWEET CLOVER).

When cut at the proper time, melilotus makes a good hay. It resembles alfalfa, being somewhat coarser, but will grow on poorer soils than alfalfa. On the bald lime-rock spots in the prairie district, it seems to be about the only plant that will thrive. The large roots, which penetrate deep into these hard places and decay, help disintegrate the soil and add fertility.

A mixture of melilotus and Johnson grass on a meadow gives fine results. The first cutting will be almost pure melilotus; the two other cuttings, a mixture of the two, make a very nutritious feed.

We have found that melilotus combines better with oats than with any other crop. The whole crop may be handled as a hay proposition, or it may be cut and threshed for grain, and the mixture of straw and melilotus be used for hay.

As a pasture crop, melilotus is good. It comes up early in the spring and furnishes good grazing throughout the season.

WHITE CLOVER.

White clover is suited only for pasture. Our results with it on Bermuda pasture have been good, but ordinarily it is an unreliable crop.

THE VETCHES.

Neither the hairy nor the smooth vetch is a first-class hay crop on account of the difficulty in harvesting and curing, but they are valuable as winter grazing crops, or as cover and green manure crops.

The seeding should be done in the early fall. At this Station spring seeding has never been satisfactory. A mixture of oats and vetch is a valuable crop for grazing or for hay, or it may be plowed under for soil improvement. If the vetch in the mixture is in excess of the oats, the harvesting will be difficult. When the crop is to be cut for hay or for grain, the best proportion of the seed is one-fourth vetch and three-fourths oats by measure. If the crop is intended for grazing or soil improvement, the amount of vetch should be more. The yield of hay from this mixture was as high as 3½ tons per acre at this Station in 1912. A mixture of vetch and oats is not to be recommended for grain, as the harvesting and threshing is too difficult. The growth of vetch is oftentimes so great that the oats are pulled down and the mixture is hard to cut even with a mower. The crops should be planted separately when grown for seed.

COWPEAS.

This is one of the best forage plants that the Mississippi farmer can grow. Cowpeas grow well on all of the different types of soil and

make better growth on poor soils than any other legume we have tested. They give good results from plantings made from the middle of April to the middle of July. There are quite a number of varieties of cowpeas, some giving better results for forage than others. The brown Whippoorwill has given us the best results for hay. The Unknown, or Wonderful, is the best variety for planting in corn. The following table gives the results of our variety tests:

Table No. 8.—Varieties of Cowpeas.

VARIETY	1911		1912		1913	
	Lbs. seed per Acre	Lbs. Dry Hay per Acre	Lbs. seed per Acre	Lbs. Dry Hay per Acre	Lbs.seed per Acre	Lbs. Dry Hay per Acre
Unknown	91.7	3333	420	3500	325	3800
New Era	100	5000	260	4850	180	3820
Taylor	717	1666	1060	1860	650	1960
Red Ripper	75	3750	920	3800	660	3410
Black	33 1-3	4500	720	4300	290	4000
Clay	58	3833	540	3660	216	3510
Brabham	8 1-3	3333	500	3325	625	3020
Large Black Eye	83	4583	720	4320	550	3950
Iron	16 2-3	5000	100	4220	150	3875
Ramshorn Early	700	3333	1080	2616	915	2020
Grant	183	3333	680	3140	410	2990
Whippoorwill	417	4583	940	4718	830	4120

Cowpeas are easily grown and can be planted in several ways, any of which will give good results. As to the time of planting, our results show that plantings from May to June 15 give larger yields of seed and hay than plantings made before and after these dates.

In a two-year test of different amounts of seed per acre, the results showed that 2 to 2½ bushels when broadcasted gave the most economical yields. While 3 bushels per acre gave a larger yield of hay, the increase over the 2 to 2½ bushels per acre was not enough to pay for the extra seed. The most economical method of planting is with some kind of a drill. When the planting is done with a drill, 1¾ bushels per acre give as good results as 2½ bushels broadcasted. Even in planting peas in corn at laying-by time, it is much better and more economical to put down the seed with a one-horse drill than to broadcast them by hand. A small drill that plants three

rows of peas in corn is better where the corn rows are wide apart. A two-row drill is recommended where the corn rows are 3½ feet apart.

For seed we have gotten best results when the peas were planted in drills 24 to 30 feet apart and cultivated once or twice.

The crop gives the best returns when it is cut for hay and fed to stock and the manure returned to the soil. The whole crop may be plowed under for soil improvement, but when it is fed to live stock and the manure returned to the soil, practically all the fertilizing elements are returned, and in addition the live stock have received a valuable lot of feed.

At this Station in 1914, a field of cowpeas having some Johnson grass mixed in was cut, and the mixture of cowpeas and Johnson grass put into one of the silos. This mixture made a good silage, which was relished very much by cattle. By planting peas on Johnson grass land, an immense amount of the mixture can be cut for the silo; but the putting of it into the silo is troublesome and slow since the handling of the tangled mass of green pea vines is very difficult.

SOY BEANS.

The soy bean is a valuable forage plant, being richer in protein than the cowpea. It is a good hay plant when cut at the proper time, which is when the first pods and leaves begin to turn yellow. The yield of seed is usually much larger from the soy bean than from the cowpea.

The table below gives the results of variety tests of soy beans:

Table No. 9.—Varieties of Soy Beans.

VARIETY	1911		1912	
	Lbs. seed per Acre	Lbs. Dry Hay per Acre	Lbs. seed per Acre	Lbs. Dry Hay per Acre
Hollybrook	866	3666	1000	3100
Black	1000	3000	1200	3200
Brown	2400	4500	1440	3680
Small Yellow	2600	5500	1600	4200
Mammoth Yellow	2117	3333	1500	4160
Early Dwarf Green	1560	2500	1000	2608

Unlike cowpeas soy beans need much attention for results. The seed bed should be carefully prepared, and the crop must be well cultivated. It is much more difficult to secure a stand of soy beans than of cowpeas. It is necessary to plant this crop in drills not closer together than 30 inches. The following table gives the results of soy beans and cowpeas planted in drills of different width:

Table No. 10.—Cowpeas and Soy Beans in Drills of Different Width.

PLAT	Yield in Hay per Acre from Cow Peas	Yield in Hay per Acre from Soy Beans
12-inch drill	3788 lbs.	4129 lbs.
20-inch drill	3562 lbs.	4166 lbs.
30-inch drill	3333 lbs.	4924 lbs.

VELVET BEANS.

This crop is more valuable in the southern part of the State than in this section. Velvet beans make a good growth here and in a few instances have matured seed. They make a good forage to be grazed off and are valuable as a soil improver. The Lyon velvet bean has given us better results than the original Florida velvet bean. It matures seed at this place, giving a fairly good yield. The Yokohoma is another good variety that we have tested, giving a good yield of both hay and seed.

MISCELLANEOUS FORAGE CROPS.

Such crops as peanuts and rape and a few others have been tested more for grazing than anything else. A mixture of rape and red clover is most excellent for hog grazing practically the whole year, the rape furnishing grazing during the late fall and winter and the clover during spring and summer.

As a hog crop, nothing has given us better results than the Spanish peanut. In addition to the peanuts, in 1912 we harvested 1½ tons of hay per acre. This hay is equal to cowpea hay in feeding value. Peanuts make the best growth on a sandy loam soil, and may be planted any time from April 15 to June 15.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

BULLETIN No. 173.

COTTON EXPERIMENTS
1915

AGRICULTURAL COLLEGE, MISSISSIPPI
January 1, 1916.

TUCKER PRINTING HOUSE JACKSON MISS

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* In co-operation with U. S. Department of Agriculture.

COTTON EXPERIMENTS
1915

By H. B. BROWN, Ph. D.

INTRODUCTION.

This bulletin is written to give the results from a part of the cotton experiments carried on in 1915 at three of the Mississippi Experiment Stations; namely, the Central Station, Holly Springs Branch Station, and Delta Branch Station. The Central Station is located at Agricultural College, near the western edge of the Northeast Prairie belt; the Holly Springs Station at Holly Springs, in the northern part of the Shortleaf Pine belt; and the Delta Station at Stoneville, in the west central part of the Yazoo Delta belt. Soil condition and weevil infestation vary considerably at the different stations; climatic conditions to a lesser extent.

The work at the Central Station was carried on by J. R. Ricks and H. B. Brown; at the Delta Station by G. B. Walker and H. B. Brown; and at the Holly Springs Station by C. T. Ames.

The seed used was furnished by the Central Station, except in a few cases where a variety was grown at one station and not at the others. The seed of any particular variety used at the different stations was from the same source, and was obtained in most cases from the originator of the variety.

Results from similar experiments carried on during the past five years are reported in Bulletins 155, 161, 164, and 169. These bulletins may be had by writing the Experiment Station, Agricultural College, Mississippi.

RESULTS FROM THE COLLEGE STATION

THE WEATHER

TABLE 1.—Temperatures and Rainfall, 1915*

MONTH.	Minimum.	Average minimum	Maximum	Average maximum	Total rainfall inches.	No. of days on which rain fell.
January	21	33.26	64	52.64	6.40	8
February	27	38.23	70	60.11	4.47	8
March	26	39.64	72	58.45	2.81	7
April	30.50	52.13	93	80.60	0.73	3
May	52	61.12	98	87.00	8.36	7
June	57	67.76	99	90.36	9.17	9
July	62	70.73	99.5	91.45	6.31	6
August	55	69.13	98	89.64	3.96	9
September	49	65.60	97	89.36	6.26	3
October	38	55.90	89	78.94	2.23	5
November	29	41.76	83	63.73	5.65	6
December	26	36.16	73	57.17	4.90	7
Total rainfall					61.50	78

*The weather records are kept by Dr. C. F. Briscoe.

As indicated by the above table, the rainfall at this place for the year 1915 was sixty-one inches, being about ten inches more than the average rainfall for the region. Thirty-nine and nine-tenth inches fell during the months beginning with March and ending with October. This was a moderately heavy rainfall for the growing season, but it was fairly well distributed.

The average temperature for March was 49.4°. This was the coldest March on record, but the average temperature for April, 66.2°, was a little above normal, and this tended to counteract the retarding influence of the colder temperature the previous month. The average temperature the rest of the growing season was about normal.

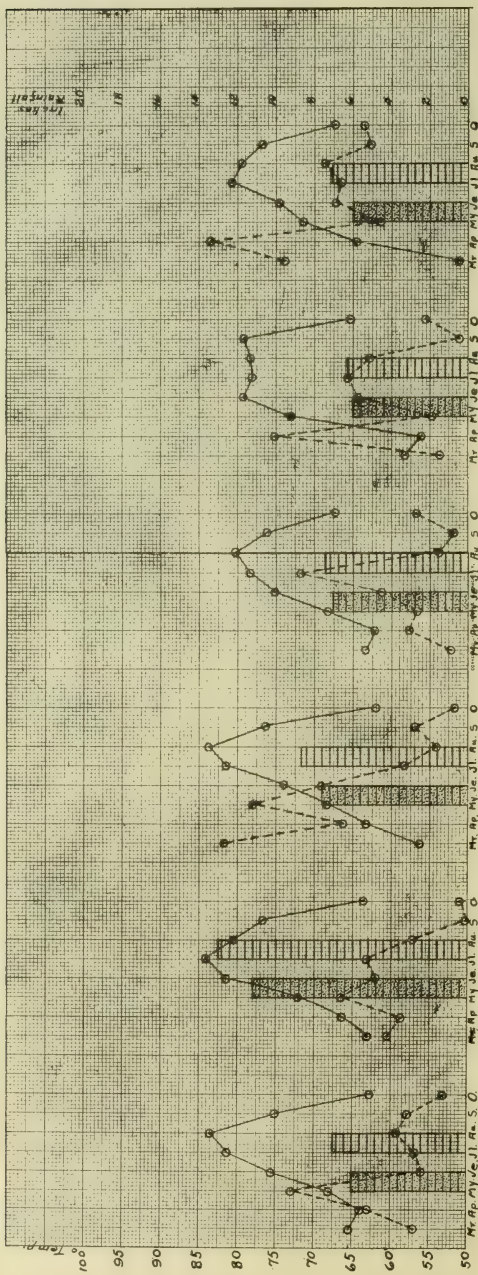

CHART I.—RELATION OF RAINFALL AND TEMPERATURE TO COTTON YIELD.

Chart 1 represents an attempt to show the relation of cotton yield to the rainfall and temperature during the cotton growing months. Data are given for the months from March to October inclusive. The broken line is the rainfall curve; the circles on it represent monthly totals. The solid line is the temperature curve, with the circles representing monthly averages. These averages were obtained by adding together the average monthly minimum and maximum and dividing by 2. Each small rectangle in upright columns represents 100 pounds of seed cotton. One variety, Cleveland Big Boll, was grown throughout the six years shown in the graph. This is represented by the rectangles which are not stippled. The stippled rectangles represent the average yield of all the varieties grown in the variety test during any one year. Some changes were made from year to year in the varieties grown. The tests were conducted on the same land after 1908. This land was in cowpeas in 1907, and was in a good state of fertility when taken for the cotton work. During 1907 the variety test was conducted on a nearby tract of land of similar nature naturally, but on which legumes had not been grown so recently.

This graph shows practically no relation between cotton yields and rainfall and temperature fluctuations as here considered. The larger yields of 1908 may be attributed to the added soil fertility, and possibly the effect of this extended over into 1909 and made the yield a little greater that year.

TABLE 2.—Variety Test at College Station, 1915

VARIETY.	Lbs. seed cotton per acre, 1st picking.	Total lbs. seed cotton per acre.	Per cent. lint.	Length of staple in inches.	Value of lint per lb. in cents.	Lbs. of lint per acre.	Value of lint per acre.	Lbs. of seed per acre.	Value of seed per acre at $30.00 per ton.	Total money value per acre.	Rank in money value.	Weight of 100 bolls in oz.	Germination as shown by stand 12 ds. after plntg.
Simpkins' Ideal	515	590	32.7	½	10¼	193	$19.78	397.1	$6.95	$26.73	19	18	40%
Dodds' Prolific	653	751	29.4	1 to 1 1-16	11¾	221	25.93	530	7.95	33.88	14	19	60%
Trice	638	725	30.2	1 to 1 1-16	11¾	219	25.72	506.1	7.59	33.31	15	21	40%
Wannamaker-Cleveland	680	760	36.6	1	11½	279	32.06	481.2	7.21	39.27	5	25	50%
Cleveland-027-11-24	552	636	33.6	1	11½	214	24.61	422.4	6.33	30.94	17	30	30%
Cleveland Big Boll	572	700	34.8	1	11½	244	28.06	456.4	6.84	34.90	12	31	40%
Alabama Cook	612	696	42.1	½	10¼	293	30.03	403	6.04	36.07	10	27	40%
Haaga's Wonderful	303	369	42.3	½	10¼	156	15.99	213	3.19	19.18	20	25	20%
Triumph	479	592	34.7	1 to 1 1-16	11¾	205	24.09	386.6	5.79	29.88	18	27	30%
Miller	649	807	32.6	1 to 1 1-16	11¾	263	30.90	544	8.16	39.06	8	24	40%
Lone Star-11	647	787	35.9	1 to 1 1-16	11¾	282	33.13	494.5	7.41	40.54	4	29	50%
Lone Star-15	504	639	36.4	1 to 1 1-16	11¾	232	27.26	396.5	5.94	33.20	16	27	30%
Lone Star-132	640	762	28.5	1 1-16	12¾	217	27.69	544.9	8.17	35.86	11	22	40%
Unknown	618	724	31.4	1 1-8	14	227	31.78	496.7	7.44	39.22	6	22	30%
General Express	828	909	27.2	1 1-8	14	247	34.58	661.8	9.91	44.49	1	17	70%
Express-15	750	859	29.1	1 1-16 to 1 1-8	13	250	32.50	609.1	9.13	41.63	3	15	60%
Express-122	769	865	27.7	1 1-8	14	241	33.74	624.4	9.36	43.10	2	17	50%
Durango	524	625	32	1 1-8	14	200	28	425	6.37	34.37	13	23	50%
Foster-11	543	708	32.2	1 1-8	14	228	31.92	480.1	7.20	39.12	7	25	40%
Foster-120	453	619	32.4	1 1-8 to 1 3-16	14¾	200	29.50	418.5	6.27	36.77	9	21	30%
Sunflower	117	139	28	1 3-16	15¼	39	5.95	100.1	1.50	7.45	21	16	10%

VARIETY TEST.

The main results of the Central Station variety test are shown in Table 2. The varieties listed were grown on valley loam that was in cotton the year before. The first planting was April 16th, but this failed to come up well owing to the dry weather then prevailing. The plots were planted over May 5th, and planted deeper than before. Soon after the second planting heavy rains fell and packed the ground so that the deeper planted seed did not produce a good stand. As will be seen from the last column in Table 2, seed from some varieties produced a much better stand than others. The skips in all the rows were replanted with hoes on May 18th and a nearly perfect stand secured, but the rows with a higher percentage of old plants had the advantage, for the replanted plants did not yield much on account of the boll weevil.

There were probably a few weevils in the field from the beginning of the season, for soon after the cotton began to square a few punctured squares could be found. The plots were all gone over July 1st, punctured squares picked, and mature weevils searched for. This was done again about July 15th. By August 15th the weevils were so numerous that they destroyed practically all the forms put on afterwards, and also damaged or destroyed a good many small bolls then on the plants. It is doubtful if the work of picking punctured squares and searching for weevils amounted to much, as they were not gathered in fields not far distant, and, too, the picking was not continued long enough.

The rainfall for May, June, and the first part of July was moderately heavy, but the latter two-thirds of July and August were dry. During the rainy period cotton plants adjusted themselves to wet weather conditions, developing but a small root system; then when the dry weather came on, the plants were in poor shape to withstand it, and much shedding of squares, blossoms and young bolls resulted. This shedding reduced the early crop materially, and as the weevils destroyed most of the later forms, a short crop resulted.

At the first picking, September 24th, most of the cotton was open, as will be seen from columns 1 and 2, Table 2. But two pickings were made, the second on November 17th, after frost had killed the plants.

Samples of the variety cottons were taken to Aberdeen, Mississippi, for classification. They were taken there because of convenience, and because it is a market in which a distinction in price on basis of length of staple is made; in many other markets in this part of the State, this feature is considered but little. All the samples were graded as strict middling, and the prices assigned for the different varieties were the prevailing prices for that grade in the Aberdeen market, December 2,

1915. (See column 6, Table 2.) Some of the prices given are probably higher than could be secured for the same cottons in other markets where less attention is paid to the length of staple, and where the bulk of the cotton sold is short staple.

The different strains of Express led in the test in respect to money value of lint and seed, but they had the advantage in that there was a better stand of old plants on their plots, and in that there was a premium on their staple. The medium early big boll cottons ranked well in the test, and we are inclined to think that they are the best cottons obtainable for the most of the hill region of the State, especially under boll weevil *regime*. As was pointed out in Bulletin 169 of this Station, these cottons have extensive root systems, are more vigorous in their habits of growth, and are consequently more drought resistant than the smaller, earlier varieties.

Wannamaker-Cleveland, Cleveland Big Boll, and Miller are excellent big boll varieties, but on rich bottom lands, with the boll weevil present, the smaller, early maturing varieties, such as Trice or Dodds' Prolific, will possibly be more satisfactory. Express continues to rank first, in our opinion, as a long staple cotton for boll weevil conditions. Unknown is a variety that compares very favorably with Express. Some of our new strains are promising, but seed are not yet available for distribution.

TABLE 3.—Cotton Wilt Experiment at Central Station, 1915.

VARIETY.	Lbs. seed cotton per acre.	Per cent. lint.	Length of staple in inches.	Value of lint per lb. in cents.	Lbs. of lint per acre.	Value of lint per acre.	Lbs. of seed per acre.	Value of seed per acre at $30 per ton.	Total money value per acre.	No. of plants in plot.	No. wilt infected pl'nts in plot	Yield of seed cotton per plot.	Weight 100 bolls in oz.
Trice	625	31.9	1	11½	199	$ 22.39	426	$ 6.39	$ 28.78	246	142	.096 lbs.	23
Dixie	624	33	1	11½	206	23.69	418	6.27	29.96	274	96	.086 lbs.	22
Simpkins	533	34.3	½	10¼	183	18.76	350	5.25	24.01	213	124	.095 lbs.	19
Covington-Toole	644	35.5	1	11½	228	26.22	416	6.24	32.46	255	70	.096 lbs.	19
Wannamaker-Cleveland	562	36.4	1	11½	204	23.46	358	5.37	28.83	193	106	.110 lbs.	22

COTTON WILT EXPERIMENT AT CENTRAL STATION, 1915

In this test two susceptible varieties, Simpkins and Trice; two wilt-resistant varieties, Covington-Toole and Dixie; and one variety with medium resistance, Wannamaker-Cleveland, were p'anted on silty loam land infested with the cotton wilt organism. On August 5th a number of the plants in the Trice plots were beginning to show the early stages of the disease; lower leaves and branches were beginning to wither or blight as usual with plants affected with this disease, and the interior wood of stem and roots showed dark streaks and discoloration. (The trouble, in the case of cotton wilt, is due to a fungus which lives in the soil from year to year. When cotton plants growing on infected soil reach a certain stage, threads, or hyphae, of this fungus enter the plants through their young roots and grow upward inside the vessels, or small water carrying tubes, of stem and larger roots. These fungus threads clog the vessels so that they cannot carry sufficient water to supply the plant's needs, and soon a wilting occurs. In some localities the term "rust" is applied to wilt diseased plants. In the early stages especially, the external symptoms of the two diseases are similar, but they can be distinguished easily by cutting into the wood of stem or roots with a pocket knife; if infected with wilt, dark streaks and discoloration will show in the wood. Rust is known as a physiological disease and is not caused by a fungus).

After August 5th, plants in other plots began gradually to show symptoms of wilt. The disease developed most rapidly in the Simpkins plots, but by September 24th there were a number of infected plants in all the plots. The exact numbers are given in Table 3. A good many plants among the susceptible varieties were killed outright, but in most cases they matured a few bolls before dying. The resistant varieties, Dixie and Covington-Toole, had practically no plants that showed external symptoms of the disease, and although a number of the plants were infected, their yield was not affected materially by the disease.

Table 3 gives also comparative yields, etc. The yield is low in all cases. The resistant varieties are rather late, too late apparently to be grown successfully with boll weevil infestation. Covington-Toole made the best showing of any variety grown in the test this year, and led also the three preceding years during which similar experiments were carried on. It will be seen, however, by referring to Table 3, column 12, that Wannamaker-Cleveland led in production per plant, and would doubtless have led in total production had the stand been as good. While the growing of cotton on wilt infested soil under boll weevil conditions is a doubtful proposition, we are inclined to think, from our experiments thus far, that for these conditions Wannamaker-Cleveland is the best cotton obtainable.

During the season of 1915, wilt and rust were prevalent in several of the plots and fields on the Station farm. There was practically no anthracnose, or pink boll, except in one or two plots while the plants were small.

TABLE 4.—Veldop for Boll Weevils—April Plantings.

PLOT.	Dates of Spraying.	1st picking pounds seed cotton per acre.	2nd picking pounds seed cotton per acre.	Total yield pounds seed cotton per acre.
Treated	June 19 and 26 July 8 and 20	1116	48	1164
Untreated		1134	42	1176

TABLE 5.—Veldop for Boll Weevils—June Plantings.

PLOT.	Dates of Spraying.	Pounds seed cotton per acre.
Treated	July 26 August 7 and 21.	268
Untreated		256

The spraying of the plots with Veldop was under the direction of the Department of Entomology. The spray mixture was made according to directions, and was applied as directed except in one or two instances when rain delayed the application.

DISTANCE EXPERIMENTS.

TABLE 6.—Distances in Drills, 1915.

PLOT.	Pounds seed cotton per acre 1st picking.	Pounds seed cotton per acre 2nd picking	Total pounds seed cotton per acre.
1 foot in drill	708	398	1106
2 feet in drill	542	446	988
3 feet in drill	428	406	834

TABLE 7.—Width of Rows, 1915.

PLOT.	Pounds seed cotton per acre 1st picking.	Pounds seed cotton per acre 2nd picking.	Total pounds seed cotton per acre.
3 feet apart	750	180	930
3½ feet apart	752	168	920
4 feet apart	774.4	105.6	880
4½ feet apart	712	96.8	808
5 feet apart	640	56	696

All of the above plots were on fairly rich valley land, and under normal conditions would have produced a bale or more of cotton per acre. The boll weevils destroyed everything after August 15th.

TABLE 8.—Distances in the Drill for Six Years.

PLOT	1910 *Total lbs. seed cotton per acre.*	1911 *Total lbs. seed cotton per acre.*	1912 *Total lbs. seed cotton per acre.*	1913 *Total lbs. seed cotton per acre.*	1914 *Total lbs. seed cotton per acre.*	1915 *Total lbs. seed cotton per acre.*	Average. *Total lbs. seed cotton per acre* 6 years.
1 foot	2362	1468	1332	2040	1553	1106	1643.5
2 feet	2075	1414	1264	1608	1403	988	1458.7
3 feet	1868	1300	976	1200	1153	834	1222

All the above plots were on four-foot rows.

TABLE 9.—Width of Rows for Five Years.

PLOT	1911 *Total lbs. seed cotton per acre.*	1912 *Total lbs. seed cotton per acre.*	1913 *Total lbs. seed cotton per acre.*	1914 *Total lbs. seed cotton per acre.*	1915 *Total lbs. seed cotton per acre.*	Average. *Total lbs. seed cotton per acre five years.*
3 feet	1626	1236	1780	1660	930	1446
3½ feet	1488	1250	1510	1336	920	1301
4 feet	1324	1153	1230	1220	880	1161
4½ feet	1346	1181	1020	1200	808.8	1111
5 feet	1231	1098	910	1176	696	1022

All the above plots were thinned to 12 inches in the drill.

TABLE 10.—Variety Test at Holly Springs Branch Experiment Station.

VARIETY.	Lbs. seed cotton per acre, first picking Sept. 10	Total lbs. seed cotton per acre	Per cent. lint	Length of staple in inches	Value of lint per lb. in cents	Lbs. of lint per acre	Value of lint per acre	Lbs. of seed per acre.	Value of seed per acre at $30 per ton	Total money value per acre	Rank in money value	Weight of 100 bolls in oz.
Simpkins' Ideal	457	1843	34.6	7-8	10 1-4	638	$65.39	1205	$ 18.07	$ 83.46	23	19
Dodds' Prolific	385	2066	31.4	1 to 1 1-16	11 3-4	649	76.26	1417	21.25	97.51	22	19.5
Trice	643	2116	31.5	1	11 1-2	666	76.59	1450	21.75	98.34	21	19.75
Wannamaker-Cleveland	328	2246	38.6	1	11 1-2	867	99.70	1379	20.68	120.38	7	23.5
Cleveland-027-11-24	628	2275	31.1	1	11 1-2	707	81.30	1568	23.52	104.82	20	27.
Cleveland Big Boll	328	2325	37.1	1	11 1-2	863	99.24	1462	21.93	121.17	5	27.5
Alabama Cook	257	1966	44	1-2	10 1-4	865	88.66	1101	16.51	105.17	19	25.5
Haaga's Wonderful	443	1980	44.3	1-2	10 1-4	877	89.89	1103	16.52	106.41	18	23
Dat So	701	2146	35	1	11 1-2	750	86.25	1396	20.94	107.19	17	19.75
Triumph	357	2109	36.4	1 1-16	12 3-4	767	97.93	1342	20.13	118.06	10	26.95
Miller	428	2218	35.4	1 1-16	12 3-4	785	100.08	1433	21.49	121.51	4	26.5
Lone Star-11	443	2131	36.3	1 1-16	12 3-4	774	98.68	1357	20.35	119.03	9	31
Lone Star-15	514	2153	38	1 to 1 1-16	11 3-4	818	96.11	1335	20.02	116.13	11	27.5
Lone Star-132	743	2260	30.7	1 1-16	12 3-4	694	88.48	1566	23.49	111.97	15	19.75
Unknown	486	2254	33.4	1 1-16	15 1-4	753	114.84	1501	22.51	137.35	1	21
General Express	486	2189	29.7	1 1-8	14	650	91	1539	23.08	114.08	13	17.25
Express-15	671	2239	30.8	1 1-8	14	690	96.60	1549	23.23	119.83	8	16
Express-122	743	2260	29.4	1 3-16	15 1-4	664	101.26	1596	23.94	125.20	2	19.75
Polk	571	2232	31.3	1 1-8	14	698	97.72	1534	23.01	120.73	6	19
Durango	336	1858	34.5	1 1-8	14	641	89.74	1217	18.25	108.19	16	23.5
Foster-11	328	1987	34.5	1 1-8	14	685	95.90	1302	19.53	115.43	12	22
Foster-120	601	1930	33	1 1-8 to 1 3-16	14 3-4	637	93.96	1293	19.39	113.35	14	23.5
Sunflower	301	1865	29.7	1 5-16 to 1 3-8	19	554	105.26	1311	19.66	124.92	3	18.5

RESULTS FROM HOLLY SPRINGS STATION.
VARIETY TEST, 1915.

Table 10 gives the main results of the variety test at the Holly Springs Station for 1915. This cotton was planted April 26th on valley land in one-row plots repeated five times, thus making 1-14.4 of an acre for each variety. The rows were 4 feet apart with plants 12 to 14 inches apart in the row. The plants came up to a nearly perfect stand; there were no boll weevils to bother; the season was favorable; and, on the whole, the test may be considered a splendid one.

Samples of the varieties grown were classed at Aberdeen, and the prices based on the market there for December 2, 1915. All samples were graded as strict middling. It should be noted, however, that the prices listed are on the basis of a cotton market better than the average, and could probably not be secured in all interior markets.

For the hill section of the State we call your attention to Wannamaker-Cleveland, Cleveland Big Boll, Miller, and Triumph as being among the leading varieties.

TABLE 11.—Variety Test at Delta Branch Experiment Station.

VARIETY.	Lbs. seed cotton per acre, first picking	Total lbs. seed cotton per acre	Per cent lint	Lint index	Length of staple in inches	Value of lint per lb. in cents	Lbs. of lint per acre	Value of lint per acre	Lbs. of seed per acre	Value of seed per acre at $30 per ton	Total money value per acre	Character of lint	Weight of 100 bolls in oz.	Rank in money value
Simpkins' Ideal	1115	1442	34.3	5.45	1-2	10.25	495	$50.74	947	$14.20	$64.94	Soft and wasty	18	25
Dodds' Prolific	954	1317	32.2	4.78	1 1-8	14.25	425	60.42	893	13.39	73.81	Fairly good	19	19
Trice	1321	1613	32.4	5.02	1	11.25	522	58.72	1091	16.36	75.08	Soft	20	17
Wannamaker-Cleveland	1155	1498	38.3	6.80	3-4	11.25	573	64.46	925	13.87	78.33	Fairly good	24	14
Cleveland-027-11-24	1123	1463	35.1	7.28	3-4	11.25	515	57.94	948	14.22	72.16	Fairly good	27	21
Cleveland Big Boll	1103	1616	36.9	8.17	1 to 1 1-16	11.50	596	68.54	1020	15.30	83.84	Poor	27	11
Alabama Cook	1183	1625	44.4	8.66	1-2	10.25	720	73.80	905	13.57	87.37	Poor	26	5
Haaga's Wonderful	938	1346	44.9	8.25	1-2	10.25	604	61.91	742	11.13	73.04	Poor	25	20
Miller	986	1577	34.8	6.85	1 1-16	12.25	548	67.13	1029	15.43	82.56	Fairly good	26	12
Triumph	1047	1598	35.9	7.2	1 1-16	12.25	573	70.19	1025	15.37	85.56	Fairly good	26	7
Lone Star-11	1059	1632	36.3	8.16	1 1-16	12.25	598	73.25	1034	15.51	88.76	Fairly good	31	3
Lone Star-15	1047	1571	38.2	7.7	1 1-16	12.25	600	73.50	971	14.56	88.16	Fairly good	26	4
Lone Star-132	1289	1730	29.3	4.55	1 1-8	14.25	506	72.10	1224	18.36	90.46	Good	22	2
Unknown	942	1388	33.3	5.04	1 1-8	15.25	462	70.45	926	13.89	84.34	Fairly good	21	10
General Express	1075	1405	29.6	4.45	1 1-8 to 1 3-16	15.50	416	64.48	989	14.83	79.31	Fairly good	18	13
Express-15	1184	1552	30.9	4.43	1 1-8	14.25	482	68.68	1070	16.05	84.73	Fairly good	18	9
Express-122	1225	1528	30	4.17	1 1-8 to 1 3-16	15.50	458	70.99	1070	16.05	87.04	Fairly good	18	6
Polk	1164	1524	28.5	4.37	1 1-8	14.25	434	61.84	1090	16.35	78.19	Soft	18	15
Foster-120	1010	1402	33.2	5.14	1 1-8	15.25	465	70.91	937	14.05	84.96	Fairly good	23	8
Foster-11	1093	1500	32.2	5.56	1 3-16 f	16	483	77.28	1017	15.25	92.53	Fairly good	24	1
Durango	710	1260	32.3	6.08	1 1-8	15.25	407	62.07	853	12.79	74.86	Good	21	18
Kentucky Favorite	925	1342	31.4	5.24	1 1-16 to 1 1-8	13.50	422	56.97	920	13.80	70.77	Soft and wasty	18	23
Sunflower	809	1131	28.4	4.19	1 3-16 f	16	378	60.48	753	11.29	71.77	Soft	16	22
Fondren	734	1176	29.9	4.56	1 3-16	16	352	56.32	824	12.36	68.68	Poor	17	24
Harris	809	1220	30.8	4.17	1 3-16 to 1 1-4	17	376	64.92	844	12.66	77.58	Fairly good	17	16

RESULTS FROM THE DELTA STATION VARIETY TEST, 1915.

In Table 11 the chief results of the Delta Station test are given. In this test the cotton was grown on light loam soil of only moderate fertility and was planted April 26th in rows 3 feet 8 inches apart; the stalks stood about 15 inches apart in the row. The ground being well pulverized and in excellent order when the planting was done, the cotton came up quickly to a splendid stand. Growth was good during the first part of the season, but the dry weather during July and August interfered with the fruiting. Prior to August there were but very few boll weevils to be found in the plots, but during that month they increased rapidly and were present in sufficient numbers to destroy practically all of the late crop.

Samples of lint from all the varieties were classed and priced by Magee, Dean Cotton Company, of Leland, Mississippi, December 14, 1915, and our calculations are based on the valuation current in the Leland market at that time.

In column 4 of Table 11 is given the lint index of the different varieties. By lint index, as here used, is meant the weight of lint on a hundred seeds. Gram is the weight unit used. The lint index is, in some respects, of more value than the lint per cent in determining the value of a cotton or in selecting cotton. Selecting on basis of lint per cent alone, as pointed out by Cook*, places a premium on small or light seeds, since small or light seeds are apt to bear lint of a greater weight proportionally. Continued selection on this basis may so reduce the size of the seed as to weaken them and diminish their fertility.

**Danger in Judging Cotton Varieties by Lint Percentages*, by O. F. Cook, Cir. No. 11, Bu. Plant Ind., U. S. D. A.

TABLE 12.—Preliminary Variety Test at Delta Branch Experiment Station.

VARIETY.	Lbs. sd. ctn. per acre. first pkng.	Total lbs. seed cotton per acre.	Per cent. lint.	Lint index.	Length of staple in inches.	Value lint per lb. in cents	Lbs. of Lint per acre.	Value lint per acre.	Lbs. of seed per acre.	Value of seed per acre at $30 per ton.	Total money value per acre.	Weight 100 bolls in oz.
Dat So	1118	1387	34.3	5.56	1 to 1 1-16	11½	476	54.74	911	$ 13.66	$ 68.40	22
Sharbrough	1080	1360	34.9	4.82	½	10¼	474	48.58	886	13.29	62.39	18
Express	973	1308	29.6	4.42	1 1-8	14¼	387	55.15	921	13.81	68.96	20
Herrin	743	1183	32.4	4.82	1 1-16 to 1 1-8	13½	383	51.70	800	12	63.70	20
34–122	778	1048	34.8	5.75	1 1-8 f	15¼	364	55.51	684	10.26	65.77	22

PRELIMINARY VARIETY TEST.

Table 12 gives the results of a preliminary variety test conducted at the Delta Station in 1915. This test contained but five varieties, but was conducted under conditions similar to those of the larger test with the exception that the plots were somewhat smaller. The remarks and explanations made in connection with the other test apply to this as well.

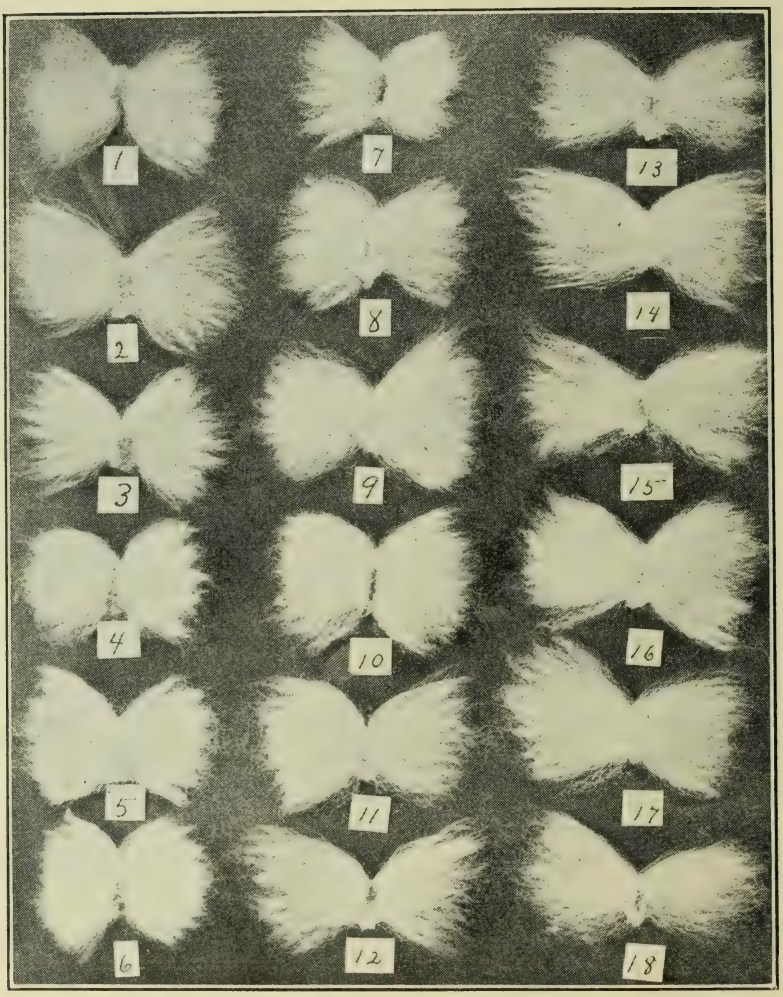

FIG. I.—COTTON EXPERIMENTS, 1915.

1. Simpkins' Ideal
2. Dodds' Prolific
3. Trice
4. Wannamaker-Cleveland
5. Cleveland Big Boll
6. Alabama Cook
7. Haaga's Wonderful
8. Triumph
9. Miller
10. Lone Star-11
11. Lone Star-132
12. Unknown
13. Express
14. Polk
15. Foster-11
16. Durango
17. Sunflower
18. Harris.

The cotton seeds with lint attached, illustrated by Fig. 1, were taken at random from samples of seed cotton of each of the above named varieties. The samples came from the Delta Station. The lint length, it will be observed, corresponds rather closely on the whole with that given by the classers.

TABLE 13.—Variety Averages from the Three Stations, 1915.

VARIETY.	Total lbs. seed cotton per acre.	Per cent lint.	Length of staple in inches.	Lbs. of lint per acre.	Value of lint per acre.	Lbs. of seed per acre.	Value of sd. pr. acre at $30.00 per ton.	Total money value per acre.	Rank in money value.	Weight of 100 bolls in oz.
Simpkins' Ideal	1291	33.9	5-8	442	$ 45.30	849	$ 12.73	$ 58.03	21	18.33
Dodds' Prolific	1378	31	1 1-16	431	54.20	947	14.23	68.43	17	19.16
Trice	1484	31.4	1	469	50.34	1015	15.17	66.10	19	20.25
Wannamaker-Cleveland	1501	37.8	11-12	573	65.41	928	13.92	79.33	8	24.16
Cleveland-027-11-24	1458	33.3	11-12	479	54.62	979	14.68	69.30	16	28
Cleveland Big Boll	1547	36.3	1	568	65.28	979	14.68	79.96	6	28.50
Alabama Cook	1429	43.5	½	626	64.16	803	12.04	76 20	13	78.50
Haaga's Wonderful	1231	43.8	½	546	55.93	685	10.27	66.00	20	24.33
Triumph	1433	35.7	1 5-96	515	64.07	918	13.77	77.84	11	26.65
Miller	1534	34.3	1 6-96	532	66.04	1002	15.03	81.07	5	25.50
Lone Star-11	1516	36.2	1 6-96	551	68.35	965	14.47	82.82	3	30.33
Lone Star-15	1454	37.5	1 4-96	550	65.62	904	13.56	79.18	10	28.33
Lone Star-132	1587	29.5	1 8-96	472	62.75	1115	16.72	79.47	7	21.25
Unknown	1455	32.7	1 14-96	481	72.24	974	14.61	86.85	1	21.33
General Express	1501	28.8	1 13-96	438	63.35	1063	15.94	79.29	9	17.41
Express-15	1550	30.3	1 11-96	474	59.93	1076	16.14	76.07	14	16.33
Express-122	1551	29.0	1 15-96	454	68.66	1097	16.45	85.11	2	18.25
Durango	1247	32.9	1 12-96	416	59.93	831	12.46	72.39	15	22.50
Foster-11	1398	33.0	1 14-96	465	68 36	933	13.99	82.35	4	23.66
Foster-120	1317	32.9	1 14-96	434	63.79	883	13.24	77.03	12	22.50
Sunflower	1048	28.7	1 23-96	324	57.23	724	10.86	68.09	18	16.83

TABLE 14.—Rank of Varieties Grown the Last Five Years on Basis of Mone Value per Acre.

	College Station					Holly Springs Station					Delta Station			
	1910	1911	1912	1914	1915	1911	1912	1913	1914	1915	1911	1912	1913	1914
Allen Long Staple	13													
Ashcraft Double Jointed			23				15	22				4	23	
Acala													20	
Broadwell's Double Jointed		15				12					20	4		
Brandon			8				6	21				34	19	
Brown's No. 1												35		
Black Rattler													45	
Bates														16
Cook (Cook's)	3	4	3	9		18	14	2	8		18	30	5	13
Cook's Improved No. 7	7													
Cook's Improved No. 9	1													
Cook's Improved No. 8	2													
Cook (Miss. Exp. Sta.)		9	4			19	13	16			11	32	39	
Cook's Improved No. 11	6													
Cook (Ala. Exp. Sta.)				5	10				6	23	20			12
Crawford's Big Boll												25		
Covington-Toole	5	5	12			8	26				8	41		
Cleveland No. 2	9													
Cleveland No. 1	10													
Cleveland No. 3	14													
Cleveland (Delta Sta.)												21		
Cleveland-027-11-24		19	5		17		12			20	16	15		
Cl'v'd Big Boll (J.R.Cleveland)		18	2	12	12	9	9	11	9	5	9	13	14	10
Cleveland (Wannamaker)			1	8	5		3	1	11	7		6	2	7
Columbia		3	19	1		2	19	27	2		15		40	8
Columbia (Sherrard)													16	
Christopher			15				11					26		
Calhoun								10					13	
Dixie		12	13			13	24	26			19	28	10	
Dodds' Prolific			9	13	14		4	19	13	22		2	32	5
Davis' Long Staple													36	
Dalrymple												10		9
Day												29		
Dodds' Favorite													30	
Durango				10	13			18	1	16		14	17	17
Dodds' Long Staple												16	36	
Dat so										17				
Excelsior	15													
Express				3	1			6	3	13	1		3	1
Express-15					3					8				
Express-122					2					2				
Foster			11				21					11	28	
Foster (Haaga)								4					38	
Foster (College)								12						
Foster-11					7					12				
Foster-120					9					14				
Fondren														
Gold Coin	20													
Hite			17				25					40		
Hawkins			25				23					37		
Half and Half				6				9	7				1	11
Haaga No. 2								23					24	
Hartsville													9	
Haaga No. 1													35	
Harris														
King		16				14					12			

	College Station					Holly Springs Station					Delta Station				
	1910	1911	1912	1914	1915	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
ian												42	42		
)													22		
ucky Bender													33		
ucky Favorite															23
Star		7	7			20	7	14			4	43	25		
Star-11					4					9					3
Star-15					16					11					4
Star-132					11					15					2
can Big Boll	21														
ey Maker		6	20			7	20				21	17			
ssippi Silk											22				
r				4	8				5	4			8	4	12
alfe													15		
Mac Special													37		
iplier (Allen)								28					43		
y Cain			26				17					12			
ty Day													44		
of Georgia												19			
ess													27		
)					6										15
proved King	19														
len-116		2	22			5	16				7	31			
len			21				18	3				38	18		
mond Bender													12		
ee		11				10		15			3	20	26		
ell			24				22					36			
mond Long Staple													29		
kins	17	17	14	14		16	2	20	17		17	24	41	16	
kins' Ideal				16	19				16	23				6	25
r Loaf	16														
ower		1	18	2	21	1	27	25	10	3	13	3	34	14	20
ill		20				15					23				
orough												7			
nph	4		6	11	18	6	10	7	12	10			4	15	7
nph (Gholston's)												8			
nph (from Jas. Wade)	8	8				11					6				
nph (from Excelsior S.Farm	12														
nph (from Central Station)												39			
nph (from Mebane)	4	14				6					2				
n		21	10	15	15	4	1	5	15	21	5	1	31	2	17
(from Central Station)									14						
t's 90 Day		10	16			3	5	24			14	23	44		
nton							33								
ony													7		
e Sam	18							8			11		11		
own (Allen's)				7	6			13	4	1		5	6	3	10
Early Prolific	11														
ds Wonder		13	27			17	8				10	27			
er												18	21		
derful (Haaga's)					20					18					20

MONEY VALUE RANK OF THE VARIETIES GROWN AT THE THREE EXPERIMENT STATIONS THE LAST FIVE YEARS.

Table 14 gives the rank on basis of money value of the lint and seed of nearly all the varieties grown in the variety work at the Central Station, Holly Springs Station, and Delta Station during the last five years. One year's testing does not prove or disprove the worth of a variety, although conducted as carefully as possible. Conditions vary much from year to year, and a cotton that makes a good showing under one set may do poorly under another. But a cotton that ranks well for a series of years must be regarded as a good cotton, and consequently the results shown in this table are of considerable value. By looking along the line to the right of the name of any particular variety, the performance of that variety for different years and at different places may be seen at a glance.

TABLE 15.—Average Lint per cent at the Different Stations.

	1915	1914	1913	1912	1911	*Five-year average.*
Central	32.42	34.94	36.38	33.52	34.24	34.30
Delta	33.86	33.07	35.30	33.29	33.25	33.75
Holly Springs	34.05	35.79	35.60	33.52	34.80	34.75

AVERAGE LINT PER CENT AT THE DIFFERENT STATIONS.

Table 15 gives the average lint per cent of varieties grown at each station during the years 1911 to 1915 inclusive. Only the varieties grown at all three stations during any one particular year are included in this table. Samples of seed cotton weighing 20 pounds or more were gathered from each variety at each branch station each year, and sent to the Central Station to be ginned. The ginning, weighing, and per cent computing were all done by men in charge at the Central Station.

Although there is not a great amount of difference in the averages of the three stations, there is enough for it to be of some significance. The Delta Station averages lowest for the five years, and is lowest every year during that period except one. This can probably be accounted for by the fact that the more fertile soil in that region is instrumental in producing slightly larger and heavier seeds.

CHOICE OF A VARIETY.

Frequently the question is asked, "What is the best variety of cotton?" There is no one best variety but a number of good varieties. Conditions in respect to soil fertility, rainfall, boll weevil depredations,

etc., vary greatly in different regions, and the cotton chosen must be one that is adapted to the conditions where it is to be grown. The value of a variety depends more on its selection and the care with which the seed have been handled than on its name. While there are a number of good varieties, there are none that are good if mixed or not handled with care.

DETERIORATION OF VARIETIES.

Growers are of the opinion that a variety will run out or become less valuable if grown in a locality continuously for some years. Varieties do deteriorate ordinarily after a few years, but such need not be the case. In fact, if properly handled, they will remain pure, and, by adapting themselves to the local environment, will produce better than new strains just brought in. This is well illustrated in the results from the Delta Station for this year. The five leaders in the variety test were all strains that had been selected and grown on the station farm for some time.

The progeny of a cotton plant are never all just like the parent plant; there is always more or less variation. The variations are usually mere fluctuations that are not inherited, but some are hereditary, and are known as mutations. Some of these hereditary variations, or mutations, are conspicuous and of considerable importance, producing plants of more value than the parent strain, but in the great majority of cases the new plant, or changed plant, is of less value than the parent. These less desirable plants multiply and cross, or mix, more or less with the better ones, thus increasing the number of undesirable plants in the strain. There is some deterioration, too, due to crossing, or mixing, with different varieties growing in nearby fields. Insects visiting flowers in one field and then flying to flowers in another will carry pollen and bring about more or less crossing.

Another cause of the deterioration of varieties is the mixing of seed at public gins. The gin is not cleaned thoroughly between different lots of cotton, and so some seed from the preceding batch are mixed with the lot following.

COTTON BREEDING BY FARMERS.

At present it is very evident to almost everyone interested in raising any kind of live stock that a good deal of care and attention must be devoted to their breeding if they are to be handled successfully. A much smaller number of the people interested in growing cotton realize that there is need of giving attention to the breeding of this plant if it is to be grown most advantageously. The yearly value of the cotton grown

in the State far exceeds the value of the live stock produced, and consequently its breeding calls for and deserves more attention. Almost any farmer can do something along the line of improving the crop. He can have a small seed patch in which he grows a pure strain of the variety best suited to his land, and from which he removes all plants that are off type or undesirable. By removing the undesirable plants he can continue to grow and keep up the strain, and give it a chance to become adapted to the locality. Experience has shown that seed from pure local strains produce better than foreign seed.

Another method of improving, or at least of preventing the deterioration of a strain of cotton, is to go through the field in August or September, after some of the bolls have opened, and tag a number of the superior plants,—the plants that are well fruited, have good form, and satisfactory lint. These tagged plants may be picked at one picking after their bolls have all opened. Seed from these plants can be planted in a seed patch the following year, and from these seed, other conditions being equal, a crop of better plants will likely result. Seed from this seed patch can be used for planting the whole crop the next year.

A still better method of cotton improvement, or breeding, that may be followed if the grower has the time and inclination, is to go through the field marking superior plants as mentioned above, but being more critical, marking only a comparatively small number, say one hundred, of the very best. These plants are picked later, the cotton ginned separately, and the seed from each plant planted in a separate row the following year. These progeny rows should be studied carefully for uniformity of plants, form of plants, lint characters, etc., and the cotton from each row picked and weighed separately to get a line on productiveness. Progeny rows of this sort will serve as good indices of the transmitting powers of the parent plants. Seed should be saved from one or more of the most promising of these rows, everything considered, and planted in an isolated multiplying patch the following year. The seed from this multiplying patch will be sufficient in quantity to plant a good sized field the next year.

One of the greatest hindrances to farmers in doing cotton breeding work is the ginning question. It is usually a difficult matter to get small quantities of cotton ginned so carefully that there will be no mixing of seed. However, quite small lots may be ginned by hand; or seeds may be thoroughly wetted and planted with lint attached if the planting is done by hand. Small hand power gins are used by some persons, while others, having larger lots of cotton, make use of a public gin by waiting until the busy season for the gin is over, when time can be taken to clean out the gin carefully between lots.

As mentioned before, mutations, or variations that are inherited, occur frequently in cotton fields. While most plants produced by hereditary variations are of no positive economic importance, one occurs occasionally that is of much value, and it is one of the chief duties of a

cotton breeder to look for these unusual plants among the thousands of lesser importance. Many of our most popular varieties have originated in this way. Columbia was developed from a single long-linted plant found in a cotton field at Columbia, South Carolina, by Dr. H. J. Webber in 1902. Express came from a single plant selected in a field near Paris, Texas, in 1904, by D. N. Shoemaker. Several other similar illustrations could be given. For every professional cotton breeder watching for mutations, there might be hundreds or thousands of farmers watching, and if the great army of growers were watching, would not many more be found? The cotton plant is susceptible of further improvement, and it is along the line of mutations, we believe, that our chief hope lies.

Cotton growing interests might be furthered considerably if but one variety were grown in a community. There would be no mixing in the field by insects, less mixing of seed at the gin, and the crop, being uniform, could be marketed more advantageously. But it is useless to consider plans of this sort until there is more co-operation in rural communities than at present.

IMPORTANCE OF PROTECTING THE EARLY FORMS AND BOLLS.

With heavy boll weevil infestation, we have to depend on the early squares and bolls for our crop; hence the need for protecting them as much as possible. The soil should be well pulverized before planting so that the plants will come up quickly. If the ground can be kept covered with a mulch of finely pulverized soil at all times, much less water will be lost by evaporation, and the soil moisture conditions will be much better. This will foster the more rapid growth of young plants and will reduce the amount of shedding later if dry weather comes on.

Fig. 2.—Cotton Seeds in which Boll Weevils Were Found, the two shown being among the number.

BOLL WEEVILS HIBERNATING IN COTTON SEED.

When ginning some small samples of seed cotton by hand the first of January, four weevils were found in ginning less than two pounds. These weevils were inside the seeds and had entered apparently after the seeds were nearly or quite mature, for the seed coats were about normal. Some of the seeds were hollowed out completely while the rest contained portions of the seed kernel. (See Fig. 2.) The part of the kernel left looked as if the weevil had been eating it recently. Three of the weevils were alive and active when found, the other was dead or dormant. The fact that the cotton had been in the laboratory for about three months, where the temperature is about 70° Fahr. most of the time, probably explains why these weevils were not all in a dormant condition. If there were as many weevils in every pound of cotton seed in a bushel as found in this lot, there would be more than fifty to a bushel, and doubtless some at least would live to propagate next season. An examination of seed from cotton ginned with a saw gin showed but one weevil in 10,000 seed, and it was dead. This cotton was grown in a field not far distant from the plots where the samples mentioned above were grown.

Hinds and Yothers* state: "Definite observations have been made showing that living weevils may occur in cotton seed at planting time. Numerous observations have shown that weevils have been taken into new localities through the agency of shipments of cotton seed and cotton-seed hulls from ginneries and oil mills handling infested stock." A number of investigators have reported finding boll weevils in among stored cotton seed, but no one, in so far as we have been able to learn, has found them wintering inside the seeds themselves.

In cases where cotton seed is shipped from regions of heavy infestation to weevil free regions or to regions of light infestation, it is advisable to fumigate the seed. Even in regions of heavy infestation, if there is a suspicion that the seed contains many weevils, it may be advisable to fumigate before planting.

Prof. R. W. Harned, Entomologist, says that cotton seed may be fumigated satisfactorily by placing sacks in a tight bin or box and pouring a half pint of carbon bisulphide into each sack. As soon as possible after pouring in the carbon bisulphide, the bin or box should be sealed up as nearly gas tight as can be done conveniently, and left sealed for twenty-four hours.

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* *Hibernation of the Mexican Cotton Boll Weevil*, by W. E. Hinds and W. W. Yothers, Bu. of Ent., Bul. No. 77, U . S. D. A.

SOURCE OF SEED.

The following is a list of the parties from whom seed of the varieties tested were obtained:

Simpkins' Ideal	W. A. Simpkins, Raleigh, North Carolina.
Dodds' Prolific	S. L. Dodds, Hickman, Kentucky.
Trice	Roebuck Plantation, Sidon, Mississippi.
Wannamaker-Cleveland	Wannamaker and Son, St. Matthews, S. C.
Cleveland-027-11-24	Mississippi Experiment Station.
Cleveland Big Boll	J. R. Cleveland, Decatur, Mississippi.
Alabama Cook	Alabama Experiment Station, Auburn, Ala.
Haaga's Wonderful	Oscar Haaga, Memphis, Tennessee.
Dat So	D. D. Low, Anguilla, Mississippi.
Miller	T. M. Clark, Verona, Mississippi.
Triumph	Triumph Seed Farms, Capleville, Tennessee.
Lone Star-11	Mississippi Experiment Station.
Lone Star-15	Mississippi Experiment Station.
Lone Star-132	Mississippi Experiment Station.
Unknown	J. B. Allen, Port Gibson, Mississippi.
General Express	Delta Experiment Station.
Express-15	Mississippi Experiment Station.
Express-122	Mississippi Experiment Station.
Polk	J. H. Sherrard, Sherrard, Mississippi.
Foster-120	Mississippi Experiment Station.
Foster-11	Mississippi Experiment Station.
Durango	Bureau Plant Industry, Washington, D. C.
Kentucky Favorite	S. L. Dodds, Hickman, Kentucky.
Sunflower	Marx Schaefer, Yazoo City, Mississippi.
Fondren	R. P. Turner, Tutwiler, Mississippi.
Dixie	Bureau Plant Industry, Washington, D. C.
Covington-Toole	J. E. Barr, Clio, Alabama.

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The Experiment Station is greatly indebted to Therrell and Company of Aberdeen, Mississippi, and to Magee, Dean and Company, of Leland, Mississippi. Therrell and Company classed the samples from the Central Station and the Holly Springs Station tests, while the latter firm classed the samples from the Delta Station.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

BULLETIN No. 174

I. Feeding Cottonseed Meal and Hulls to Dairy Cows.

II. Feeding Value of Cottonseed Meal vs. Cold Pressed Cottonseed Cake.

III. Feeding Value of Purchased Feeds vs. Pasture vs. Soiling Crops.

J. S. MOORE

AGRICULTURAL COLLEGE, MISSISSIPPI
1914

TELL FARMER, PRINTER, MERIDIAN

I. Feeding Cottonseed Meal and Hulls to Dairy Cows.

The object of this project, feeding cottonseed meal and hulls to Dairy Cows, was to determine: first, whether or not the continued use of cottonseed meal when fed in large quantities is injurious to dairy cows, and, if injurious, the nature and character of the injury; second, whether or not the continued use of cottonseed hulls when fed in large quantities is injurious to dairy cows, and, if injurious, the nature and character of the injury.

In arranging and carrying out the project, nine young cows that had dropped their first calves were selected. These cows were divided into three lots of three cows each. Later two heifers that had received little or no cottonseed meal or cottonseed hulls were selected and added to each lot.

When the work was started, it was decided that no rational system of feeding would make use of more than five pounds of cottonseed meal or twenty-five pounds of cottonseed hulls daily. The cows were therefore never given more than these amounts, although during the heavy feeding period, when they were giving their best flow of milk, they were fed these maximum amounts. The test continued over six years, and some of the cows were in the test the entire time.

Lot 1 received a heavy ration of cottonseed meal with little other grain feed and no cottonseed hulls for roughage.

Lot 2 received a heavy ration of cottonseed hulls with no cottonseed meal.

Lot 3 received no cottonseed products.

During the greater part of the first period, lasting 180 weeks, the cows were fed the maximum amounts of cottonseed meal and cottonseed hulls, but during the second period of 144

weeks they were fed these amounts only when giving a fair yield of milk and when pasture was not available. As a rule, during the second period little meal was fed for thirty days before calving, and no meal for a time after calving.

The results of the work can be best shown in the form of tables. The tables will be followed by notes giving the troubles in the case of each individual cow.

Table 1 shows the date test was started, the time each cow entered the test, her age, and the length of time on test.

Table No. 1. Data in regard to Cows and Heifers used for this test.

Lot	No. Cow	Breed	Age at Beginning of Test Yrs.	Mos.	Test Began	Test Closed	Time on Test Yrs.	Mos.
1.	384	Grade Jersey	2	10	Mch. 22, 1908	June 6, 1914	6	2½
	385	Grade Jersey	3	1	Mch. 22, 1908	June 6, 1914	6	2½
	398	Grade Jersey	2	4	Mch. 22, 1908	Sept. 4, 1909	1	5½
	165	Grade Holstein	0	6	Feb. 20, 1909	June 6, 1914	5	3½
	167	Grade Jersey	0	5	Feb. 20, 1909	June 6, 1914	5	3½
2.	382	Grade Jersey	2	10	Mch. 22, 1908	June 6, 1914	6	2½
	397	Grade Jersey	2	4	Mch. 22, 1908	June 6, 1914	6	2½
	400	Grade Jersey	2	2	Mch. 22, 1908	June 6, 1914	6	2½
	160	Grade Jersey	0	7	Feb. 20, 1909	Oct. 20, 1909	0	8
	169	Grade Holstein	0	5	Feb. 20, 1909	June 6, 1914	5	3½
3.	383	Grade Jersey	3	2	Mch. 22, 1908	Aug. 31, 1912	4	5
	393	Grade Jersey	2	11	Mch. 22, 1908	June 6, 1914	6	2½
	399	Grade Jersey	2	3	Mch. 22, 1908	Apr. 25, 1911	3	1
	170	Grade Jersey	0	5	Feb. 20, 1909	June 6, 1914	5	3½
	178	Grade Holstein	0	3	Feb. 20, 1909	June 6, 1914	5	3½

It has been claimed by some that heavy feeding of cotton-seed meal causes difficult breeding. Table 2 gives the number of times each cow was bred, the number of calves dropped, the dates calves were dropped, and the length of time between births.

Table No. 2. Breeding and Calving Record of Cows in Test.

Lot	No. of Cow	Times Bred	Dropped 1st Calf	Times Bred	Dropped 2nd Calf	Time Between Calvings—months	Times Bred	Dropped 3rd Calf	Time between Calving—months	Times Bred	Dropped 4th Calf	Time between Calvings—months	Times bred	Dropped 5th Calf	Time between Calving—months	Times Bred	Dropped 6th Calf	Time between Calving—months	Times Bred	Dropped 7th Calf	Time between Calving—months
1	384	1	12-20-07	3	6-16-09	18	4	11-23-10	17	1	10- 2-11	11	4	5- 5-13	19	3	7- 4-14	14			13
1	385	1	12-28-07	1	1-25-09	13	2	2-22-10	13	1	1-10-11	12	1	11-15-11	10	1	11 25-12	12	1	12- 1-13	
1	398	1	12-21-07	12	No Calf																
1	165	1	8-10-12	1	8-10-12	11	1	8-14-13	12	1	7-23-14	11									
1	167	1	9- 6-11	4	8- 4-11	11	4	2-24-13	19	1	1-19-14	11									
1	382	1	9- 5-10	6	9- 3-08	10	4	10-26-09	14	3	7-13-11	21									
2	397	1	10-23-07	1	11-12-08	12	2	11-27-09	12	1	11-26-10	12	3	7-17-12	12	2	7-13-13	12	1	7-13-14	12
2	400	1	11-13-07	1	1-12-09	12	6	4-21-10	15	2	6-13-11	14	1	10- 5-11	10	1	12- 7-12	14	2	2-12-14	14
2	169	1	12-26 07	1	12- 7-12	13	1	2- 1-14	19				1	7-12-12	13	1	5- 4-13	10	1	7-28-14	15
2	383	1	10-23-11	1	9-24-08	11	1	8-24-09	11	2	9-25-10	13	1	12- 9-11	14						
3	393	1	10-27-07	1	12-28-08	11	2	11-15-09	12	2	10-19-10	11	1	1-18-12	15	1	12- 7-12	11	1	2- 4-14	14
3	399	1	2- 1-08	1	11-23-08	12	2	12- 9-09	13	1	10-30-10	12	1	1-10-12	15						
3	170	1	11-14-07	2	7-15-12	15	1	8-15-13	13	1	6-20-14	10									
3	178	1	4-23-11	1	5- 8-12	13	1	5- 6-13	12	2	9-19-14	16									

Summarizing results in Table 2 we find that cows in Lot 1 were bred 56 times and dropped 22 calves, with an average of 14 months between calvings; that cows in Lot 2 were bred 41 times and dropped 24 calves, with an average of 13 months between calvings; that cows in Lot 3 were bred 29 times and dropped 24 calves, with an average of 12 months between calvings.

It will be noted (see Table 1) that two heifers were added to each lot on February 20, 1909. The average age of these heifers was only about five months at the time they were put on test. Table 3 shows the feed given these heifers up to the time of calving, and the dates on which their first calves were dropped.

Table No. 3. Feed of Heifers Before Calving and Age at Calving.

Lot	No. of Heifer	AGE AT Calving			Time on Test		FEED BEFORE CALVING				
		Beginning Months	Yrs.	Mos.	Yrs.	Mos.	Cottonseed Meal	Wheat Bran	Linseed Meal	Cottonseed Hulls	Hay
1.	165	6	3	0	2	6	1281	397			4326
1.	167	5	2	0	1	5	634	70			2292
2.	169	5	3	1	2	6		1315	28	5232	
3.	170	5	2	6	2	1		1181	28		3906
3.	178	3	2	5	2	2		1181	28		3906

Table 4 gives the total feed given each cow during the first period of the test, the average feed per day per cow, together with the production of milk and butter fat; the heifers in each lot are not included in the average.

Table No. 4. Summary of Feed Consumed and Production. First Period. 180 Weeks.

Lot	No. of Cow	Time on Test Weeks	Grain Feed, Lbs.					Roughage, Lbs.					Production, Lbs.		
			Cotton Seed Meal	Wheat Bran	Linseed Meal	Corn Chops	Rice Bran	Rice Polish	Hay	Cotton Seed Hulls	Corn Silage	Green Feed	Milk	Fat, Per Cent	Fat
1.	384	180	5768	1932	.....	105	147	91	10382	.....	6047	3801	20070	4.74	952.0
	385	180	5614	1813	.....	42	112	98	10453	.....	2667	3766	13096	4.47	585.6
	398	76	3467	1192	.....	.....	.....	.....	7198	.....	210	952	7737	3.76	291.2
	*165	132	1281	397	.....	.....	.....	.....	4326	.....	.....	.....	651	4.42	28.8
	167	132	1281	397	.....	.....	.....	.....	4326	.....	.....	.....	3959	4.89	193.8
Avg per cow per day			4.86	1.62	.....	0.04	0 08	0.06	9.18	.....	2.92	2.79	13 7	4 38	0.60
2.	382	180	.....	4965	877	1191	161	14	364	19446	280	840	18535	4 16	772.6
	397	180	.....	6747	730	1261	238	77	322	18774	280	616	17114	4.22	723.8
	400	180	.....	7593	870	1016	154	21	168	19355	280	875	18663	4.12	770.6
	160	8	.....	286	28	.....	.....	.....	.....	884	.....	.....	.....	.....	.....
	*169	132	.....	1265	28	.....	.....	.....	.....	4988	.....	.....	863	4.03	34.8
Avg. per cow per day			.....	5.11	0.65	0.91	0.14	0.03	0.22	15.2	0.22	0.62	14.3	4.17	0 60
3.	383	180	.....	4312	483	981	126	77	7453	.....	8415	4156	13158	4.22	555.4
	393	180	.....	4354	483	1044	259	98	7680	.....	5552	4694	15933	4.60	733.6
	399	160	.....	4108	476	1100	189	21	6754	.....	8202	2751	13498	4.03	544.4
	170	132	.....	1545	28	98	154	98	4774	.....	.....	.....	2656	3.64	96.8
	178	132	.....	1545	28	70	98	70	4704	.....	.....	.....	2928	4 24	124.1
Avg. per cow per day			.....	3.51	0.40	0.86	0.16	0.05	6 01	.....	6 09	3.19	11.7	4.34	0.50

*These heifers gave the above amount of milk before dropping first calves.

Table 5 gives the same results for the second period, including the heifers.

Table No. 5. Summary of Feeds Consumed and Production Second Period—144 Weeks.

Lot	No. of Cow	Time on Test Weeks	GRAIN, FEED, LBS.					ROUGHAGE, LBS.			PRODUCTION, LBS.		
			Cotton Seed Meal	Wheat Bran	Linseed Meal	Corn Chops	Brewers' Grain	Hay	Cotton Seed Hulls	Soiling Crops & Silage	Milk	Fat, Per Cent.	Fat
1.	384	144	2641	154	.....	.....	.....	5355	.....	5710	5274	4.83	255.0
	385	144	2844	231	.....	31	189	5520	.....	12215	11750	4.48	526.3
	165	144	3227	595	.....	.....	301	5915	.....	13765	13027	4.12	536.9
	167	144	2819	294	.....	.....	217	5677	.....	7675	10430	4.87	508.1
Avg. per cow per day			2.86	0.31	.....	.....	0.17	5.57	.....	9.76	10.0	4.51	0.45
2.	382	144	.....	3042	287	56	532	.....	9835	7210	12589	5.05	636.7
	397	144	.....	2254	315	.....	287	735	9452	7770	9784	4.45	435.5
	400	144	.....	2975	497	70	588	833	9280	8845	12760	5.29	675.1
	169	144	.....	2556	295	.....	294	455	7735	9205	13473	3.31	446.9
Avg. per cow per day			.....	2.68	0.34	0.03	0.42	0.50	9.02	8.19	12.5	4.51	0.54
3.	383	52	.....	1057	322	.....	.....	2540	.....	6020	4402	4.79	211.1
	393	144	.....	2233	364	.....	336	5460	.....	11550	10242	5.55	569.3
	170	144	.....	2147	357	70	583	4333	.....	8575	11039	4.90	541.7
	178	144	.....	2985	371	42	413	5621	.....	12215	14732	4.05	597.1
Avg. per cow per day			.....	2.18	0.41	0.03	0.39	5.21	.....	11.3	11.9	4.74	0.56

It will be noted that during the second period less meal and less hulls were fed than during the first period. During the second period there were seasons of the year when pastures were good and the cows were giving only a small yield of milk, and so very little feed of any kind, other than pasture, was used.

EFFECT OF COTTONSEED MEAL AND COTTONSEED HULLS ON COWS IN THE TEST

A record of each cow in the test, from the time she entered it until its close, was kept. The following notes indicate the abnormal conditions, if any, occurring in the case of each animal.

LOT No. 1, COTTONSEED MEAL LOT

Cow No. 384.—Dropped second calf 18 months after first calf; udder badly inflamed, requiring considerable care and poulticing for seven days.

April 2, 1910—Udder badly inflamed.

June 25, 1910—Udder badly inflamed.

Nov. 23, 1910—Dropped third calf; udder so badly inflamed one quarter was lost.

Oct. 2, 1911—Dropped fourth calf.

Jan. 22, 1913—Udder badly inflamed; poulticed for ten days, during which time wheat bran was substituted for cottonseed meal.

May 5. 1913—Dropped fifth calf; calf small, and cow very weak, apparently from calving; udder badly inflamed from May 5th to June 4th, requiring constant care and attention.

July 4, 1914—Dropped sixth calf; some inflammation of udder, but not serious. (No cottonseed meal was fed for thirty days before calving or seven days after calving.)

Cow No. 385.—Dropped second calf January 25, 1909; calf came dead and afterbirth, which had to be taken, was retained; udder badly inflamed and one quarter lost; after calving, cow in poor physical condition for three months, with little appetite.

Feb. 22, 1910—Dropped third calf; udder badly inflamed, but soon normal. (No cottonseed meal was fed after calving until inflammation had subsided.)

Jan. 10, 1911—Dropped fourth calf; udder so badly inflamed a second quarter was lost.

Nov. 15, 1911—Dropped fifth calf; udder badly swollen for ten days.

Nov. 25, 1912—Dropped sixth calf; no trouble.

Dec. 1, 1913—Dropped seventh calf; udder badly inflamed for five days.

Cow No. 398.—Dropped no calf after test began. This cow was bred twelve times to several different bulls, and later turned in pasture with a bull. After all methods of treatment had failed, she was killed on January 5, 1911, nearly three years after the beginning of test.

Cow No. 165.—This heifer was only six months of age when put in test. On May 20, 1910, about six months before she was with calf, milk was secreted in sufficient amount to make it necessary to begin milking her. Her udder became inflamed at this time, and she lost one quarter.

Sept. 6, 1911—Dropped first calf after being bred four times; afterbirth was retained, and had to be removed.

Aug. 10, 1912—Dropped second calf; on October 11, 1912 udder became badly swollen, requiring constant bathing for several days.

This cow has had two calves since above date with no further trouble.

Cow No. 167.—Bred six times after dropping first calf before conception, and aborted on August 4, 1911; afterbirth was retained.

Feb. 24, 1913—Dropped third calf after four services. No further trouble.

LOT No. 2, COTTONSEED HULLS LOT

Cow No. 382.—In normal condition throughout test.

Cow No. 397.—In normal condition throughout test.

Cow No. 400.—Bred six times before "safe in calf" after dropping second calf.

July 12, 1912—Dropped fifth calf, and had milk fever on July 13, 1912.

Cow No. 160.—Put on test February 20, 1909, when seven months old. Died very suddenly on October 20, 1909 from some unknown cause.

Cow No. 169.—Put on test when five months old. On May 20, 1909 this cow had developed a fair sized udder, it becoming necessary to put her in barn and milk her regularly. There was considerable inflammation in the udder, and it was found that she had one "blind teat."

Dropped three calves with no further trouble.

LOT No. 3, CONTROL LOT

Cow No. 383.—After being in normal condition and dropping five calves about twelve months apart, this cow became apparently barren; although bred eight times, after December 9, 1911 had no calf.

Cow No. 393.—In normal condition throughout test.

Cow No. 399.—In normal condition until April 1911, when she appeared to be suffering from constipation. She was treated for this trouble, but died on April 25, 1911. Post-mortem examination showed only an enlarged and diseased liver.

Cow No. 170.—In normal condition throughout test.

Cow No. 178.—In normal condition throughout test, with the exception of slight inflammation of udder in June and again in September, 1913.

Summary. There were 14 cases of garget in cows of Lot 1, one case in Lot 2, and two slight cases in Lot 3.

In Lot 1 one cow lost two quarters of her udder, and two cows lost one quarter each.

In Lot 2 one cow lost one quarter.

In Lot 1 three cows retained afterbirth.

In Lot 1 there was one case of abortion.

In Lot 1 one calf came dead, and another one was very weak at birth.

In Lot 1 two cows were in poor physical condition for a time.

In Lot 1, and to a smaller extent in Lot 2, there was some difficulty in getting the cows "safe with calf."

In Lot 2 one cow had milk fever.

In Lot 2 one calf died after being in test for eight months.

Conclusions. Results indicate that the feeding of five pounds of cottonseed meal for any length of time is injurious to the dairy cow, causing inflammation of the udder, difficult breeding, and probably having a tendency to cause retention of afterbirth.

Feeding cottonseed hulls in the quantities given appears to cause difficult breeding, though not to the same extent as the feeding of cottonseed meal.

In the above test it has been clearly shown that bad effects may follow the use of cottonseed meal in too large amounts. While this is true, it is a fact that a large part of the grain ration may be cottonseed meal. Where plenty of silage is available for the winter months and good pastures are provided for spring, summer, and fall so that the cows will not require much grain feeding during a large part of the year, as much as four pounds of cottonseed meal has not seemed to injure the cow in any way.

II. Cottonseed Meal vs. Cold Pressed Cot tonseed Cake for Dairy Cows.

Three lots of seven cows each were used in the test to determine the feeding value of cottonseed meal vs. cold pressed cottonseed cake. Each lot was given the same feed for a period of three weeks, consisting of an average ration of 4 pounds of cottonseed meal, 7 pounds of Johnson grass hay, and 42 pounds of corn silage. The cows were then divided into three lots and fed for a period of nine weeks on the following average ration for the cows in each lot:

DAILY RATION

Lot No.	No. of Cows	Cotton Seed Meal, Lbs.	Cold Pressed Cotton Seed Cake, Lbs.	Wheat Bran Lbs.	Cotton Seed Hulls, Lbs.	Johnson Grass Hay, Lbs.
1.	7	5	.....	3	2½	13 3-7
2.	7	.....	7½	3	.....	13 3-7
3.	7	5	.....	3	.....	15 3-7

From the above table it will be noted that 5 pounds of cottonseed meal and 2½ pounds of cotton seed hulls were fed against 7½ pounds of cold pressed cottonseed cake, and against 5 pounds of cottonseed meal and 2 pounds of hay.

At the close of the test period, the cows were again put on the same average ration for each lot and fed for a period of four weeks. The ration consisted of good pasture and 4 pounds of cold pressed cottonseed cake.

The following table shows the average weekly milk production of the cows in each lot for the three periods, and the weight of the cows at the beginning and at the close of the test period.

	Lot	No. of Cow	Preliminary Period 3 Weeks Average Milk Per Week Lbs.	Test Period 9 Weeks. Average Milk Per Week, Lbs.	Final Period 4 Weeks. Average Milk per week. Lbs.	Weight of Cows Test Period	
						At Beginning	At Close
Cotton Seed Meal & Cotton Seed Hulls	1.	240	122	107	119	580	603
		402	155	136	148	735	750
		435	124	121	118	717	737
		122	143	132	146	815	862
		190	220	175	198	845	847
		60	179	180	193	887	851
		161	199	160	160	1000	1012
		Total	1142	1011	1082	5579	5662
		Average	163	144	155	797	809
Cold Pressed Cotton Seed Cake	2.	242	120	104	97	860	867
		409	147	138	150	805	780
		438	121	124	148	715	713
		492	163	153	165	852	852
		200	220	188	216	845	876
		232	173	179	135	745	788
		414	212	174	193	865	882
		Total	1156	1060	1104	5687	5758
		Average	165	151	158	812	822
Cotton Seed Meal & Johnson Grass Hay	3.	239	134	114	144	820	795
		425	149	138	163	660	655
		276	139	128	139	735	726
		237	151	120	146	860	875
		243	194	179	171	930	924
		73	153	136	132	670	667
		263	202	191	206	840	844
		Total	1122	1006	1101	5515	5486
		Average	160	144	157	788	784

RESULTS AND CONCLUSIONS—If we take the average yield of milk per cow per week for the preliminary and final periods when the cows were on the same rations, we find that the cows of lot 1 gave 159 pounds; lot 2, 161.5 pounds; and lot 3, 158.5 pounds. The average for the test period for lot 1 was 144 pounds; lot 2, 151 pounds; and lot 3, 144 pounds.

The cows in lot 1 gained 12 pounds in body weight; those in lot 2, 10 pounds; and those in lot 3 lost 4 pounds.

The results from these three rations are very nearly the same. Those from lot 2, where cold pressed cake was used, were slightly better than from the other two.

RELATIVE VALUE OF GRAIN FEEDS.

For a number of years the Mississippi Experiment Station has been making actual feeding tests to determine the relative value of some of the most common grain feeds used by our dairymen and farmers. The value of thoroughly reliable data along this line can hardly be over-estimated, and while some of

the information given below has been published in former bulletins, it is included here since the bulletins are no longer available for distribution.

Tests have been made as follows:

1. Cottonseed meal compared with cottonseed.
2. Cottonseed meal compared with corn and cob meal.
3. Cottonseed meal compared with wheat bran.

In making these tests, peavine or Johnson grass hay and corn silage formed a part of the rations.

From these tests the following conclusions were drawn:

1. One pound of cottonseed meal equals one and seventy one-hundredths pounds of cottonseed.
2. One pound of cottonseed meal equals two pounds of corn and cob meal, or corn meal.
3. One pound of cottonseed meal equals one and one-half pounds of wheat bran.

If the feeder will use these values in the light of the preceding results in feeding cottonseed meal, he will be better able to select feeds which will give the greatest returns for the least money.

III. Purchased Feeds vs. Pasture vs. Soiling Crops.

Many dairymen feel that very little profit can be realized from their herds with the present cost of feed stuffs and the prices received for dairy products. It is still the practice on many farms to depend upon buying the feeds necessary for the stock. Except under very favorable conditions and with cows above the average in milk and butter production this practice will not prove profitable.

In order to determine the influence on the profits secured by different methods of feeding, fifteen cows were selected and divided into three lots of five cows each. They were fed for three periods of six weeks each.

During the first period of six weeks, cows in Lot 1 received purchased feeds, the cheapest that could be bought—quality considered; cows in Lot 2 were on good pasture of oats and hairy vetch; cows in Lot 3 were fed alfalfa as a soiling crop.

During the second period of six weeks, Lot 1 received purchased feeds; Lot 2 were put on pasture of bermuda, white clover, smooth vetch, and mixed grasses; Lot 3 were fed alfalfa and Johnson grass as soiling crops.

During the third period of six weeks, Lot 1 were fed on alfalfa and Johnson grass as soiling crops; Lot 2 remained on pasture as in second period; Lot 3 received purchased feeds.

It will be noted that the cows on pasture and those getting soiling crops received about a half ration of grain feed in addition.

Value of Feeds.—The market value of all dry feeds was used in estimating the cost of the feed eaten by each lot. Soiling crops were valued at the cost of production, including rent on land, cost of seed, planting, etc. Estimated values are as follows.

Cottonseed meal, per ton	$28.00	Johnson grass hay, per ton	$12.00
Wheat bran, per ton	28.00	Alfalfa hay, per ton	15.00
Green alfalfa, per ton	1.50	Cottonseed hulls, per ton	8.00
Green Johnson grass, per ton	1.50	Pasture per cow, per month	.75

The following table shows a summary of the results of the three periods, a total of eighteen weeks:

Table 1. Feeding Purchased Feeds vs. Pasture vs. Soiling Crops. 18 Weeks.

Period	FEEDS	Average Weight of Cows		Kind and Amount of Feed						Cost of Feed	YIELD			Value of Milk at 20c Per Gallon	Profit Over Cost of Feed
		At Beginning	At Close	Cotton Seed Meal	Wheat Bran	Alfalfa Hay	Johnson Grass Hay	Soiling Crops	Cotton Seed Hulls		Milk, Lbs.	Fat, Per Cent.	Fat, Lbs.		
1.	Purchased Feeds			882	504	1400			2968	$ 42 76	4772	4.29	204.76	$111.00	$ 68.24
2.	" "	769	730	847	518	3308				43.91	3367	4.55	153.37	78.20	34.29
3.	" "	782	903	771	506	1267	1673			37 41	2537	5.32	135.08	59.00	21.59
	Totals			2500	1528	5975	1673		2968	124.08	10676		493.21	248.20	124 12
1.				378	378				385	17.77	4750	4.44	210.85	110.40	92.63
2.	Pasture	836	794	378	378					16.23	3571	4.92	175 64	83.00	66.77
3.		794	963	399	370					16.41	2727	5.26	143.65	63.40	46.99
	Totals			1155	1126				385	50.41	11048		530.14	256.80	206.39
1.	Soiling			378	378			11300	500	21.05	4627	4.40	203.60	107.60	86.55
2.	Crops	810	782	368	380			9600		17 67	3453	4.91	169.42	80.20	62.53
3.		730	857	399	370			9744		18.07	2832	4.95	140 24	65.80	47.73
	Totals			1145	1128			30644	500	56.79	10912		513.26	253.60	196.81

Points of Interest in the Above Table.—Good pasture was provided during the entire period for the cows on pasture. These cows led in milk production, although it was our plan to so feed the different lots that about the same amount of milk would be produced by each lot; they produced during the eighteen weeks a total of 11048 lbs. of milk.

A comparison of the cost of feed for the several lots shows a marked difference. The cost of feeding the cows receiving purchased feeds the first period was $42.76, the second period $43.91, the third period $37.41—total cost being $124.08, or 19.52 cents per cow per day. The cost of feed for cows on good pasture the first, second, and third periods was $17.77, $16.23, and $16.41 respectively—a total of $50.41, or 8.0 cents per cow per day. The cost of feed for lot receiving soiling crops the first, second, and third periods was $21.05, $17.67, and $18.07 respectively—a total of $56.79, or 9.0 cents per cow per day.

At the close of the third period the cows had been in milk since calving about seven and a half months, and while above the average cow in the State in yield of milk and butter, they had about reached the point where with only purchased feeds the value of the milk would have little more than paid for the feed eaten. There was no great difference in the cost of feeding soiling crops and providing good pasture, but where it was necessary to purchase all the feed used the cost was more than doubled. The difference in favor of the pasture lot over the lot receiving purchased feeds was 11.52 cents per cow per day; in favor of the soiling crop over the lot fed purchased feeds, 10.52 cents per cow per day.

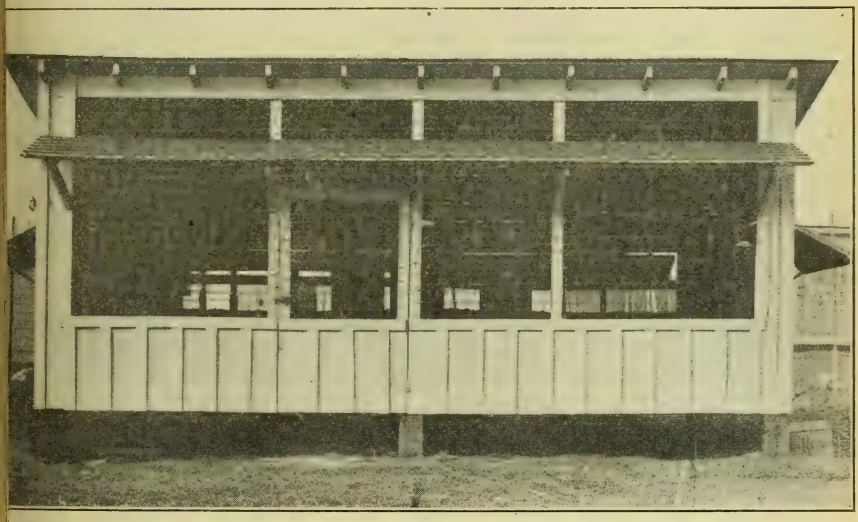
The value of the above facts will be appreciated when it is realized that either good pasture or soiling crops can be provided at least eight months in the year. Usually by a combination of the two methods the time can be extended to nine, or even ten months.

BULLETIN No 175 AUGUST, 1916

Mississippi Agricultural Experiment Station

COTTONSEED MEAL: A GOOD FEED FOR LAYING HENS

By E. P. CLAYTON



MISSISSIPPI POULTRY HOUSE

This house is arranged with double pens, and provides roosting and laying room for 100 hens. Similar houses can be built on any farm at a moderate cost.

AGRICULTURAL COLLEGE, MISSISSIPPI

TELL FARMER, PRINTER
MERIDIAN

COTTONSEED MEAL—A GOOD FEED FOR LAYING HENS

By E. P. CLAYTON

The hen is a machine to convert raw feed into the delicious finished product—the egg. That she may produce eggs for her owner's profit, she must first have both the quantity and variety of feed essential to her bodily needs. How evident it is, that every owner of hens should plant such a variety of grains and grasses as will at all times insure proper vegetable matter for the poultry. Green feeds—like oats, rye, wheat, rape, collards, some of the clovers—are necessary that hens may be healthy and may produce their maximum number of eggs. Protein in some form is likewise essential. Butter milk, an excellent protein food, should be given in liberal quantities. Where it is available, the farmer should feed some by-product of the packing houses—commercial beef scraps, for example. These by-products, unfortunately, are unobtainable in the small towns of the South. Though rich in protein, they are, moreover, so costly as to cut materially into poultry profits.

Fortunately the Southern farmer needs to provide protein food only during the fall and winter months. During the spring and summer, where hens have range of the farm, they can pick up bugs and worms enough to supply their needs in protein feed. The farmer, furthermore, need provide little succulent matter; in our temperate climate, in almost any month, hens find plenty of grass. If, however, he would have his poultry profitable not only in summer but in winter when grass is less abundant and when worms are hibernating, he must provide a winter pasture and must procure protein in some form for the daily ration.

COTTON SEED MEAL AS A CHICKEN FEED

An excellent protein feed is cotton seed meal. This meal, which is from 33 per cent to 40 per cent protein, has for a number of years been fed with good effects to dairy and to beef cattle, but until recently has not been tried scientifically with poultry. The Mississippi A. and M. College Experiment Station has conducted three feeding experiments with it; two with lay-

ing hens and one with fattening broilers. The first experiment with hens has been described in Bulletin 162 of this station. The second with hens and the experiment with fattening broilers are described in the present bulletin.

COTTON SEED MEAL FOR LAYING HENS

The second experiment with laying hens embraced two tests. Of these the first was with two pens of Rhode Island Reds, nine in each pen. The hens, though old and laying few eggs, were of equal age. The pens were covered, so that nothing should go wrong in the feeding; the hens could fly neither in nor out. The fowls, of both pens, were fed Purina hen feed and a mash of corn meal, wheat bran, oats, and a protein substance. Eleven per cent of the mash given the fowls in pen A was cotton seed meal; the equivalent in protein value of beef scrap was fed the fowls in pen B. The Purina feed was given in straw twice each day—all they could eat at night, a little less in the early morning. The composition of the mash for each pen was as follows:

Pen A.		Pen B.	
Cotton seed meal	11 Parts	Beef scrap	5½ Parts
Corn meal	50 Parts	Corn meal	50 Parts
Oats	29 Parts	Oats	29 Parts
Wheat bran	10 Parts	Wheat bran	10 Parts

The details of the test follow:

	lbs.	lbs.
Mash eaten	125	120
Grain eaten	213	177
Total feed	338	297
Cost of feed	$6.76	$5.94
Eggs laid in October	40	12
Eggs laid in November	25	10
Eggs laid in December	88	28
Eggs laid in January	45	36
Eggs laid in February	86	55
Eggs laid in March	45	33
Total eggs laid	249	174
Cost of feed per hen	$0.75	$0.66
Cost of producing an egg	$0.027	$0.034

The hens in pen A, fed cotton seed meal, ate more mash and more grain than the hens in pen B, fed beef scrap, but they laid many more eggs, at a smaller cost per egg.

In the collateral test White Leghorns instead of Rhode Island Reds were used. In pen K were placed fourteen hens, one of which died during the test, on February 2, of an unknown cause; in D, the check pen, seven hens were put. As in the foregoing test care was exercised to insure accurate results. The hens, though old, were of equal age. Each pen was covered to prevent birds going either in or out. The fowls of each pen were fed Purina hen feed and a mash consisting of corn meal, wheat bran and a protein.

The composition given each pen follows:

Pen K.		Pen D.	
Cotton seed meal	22 Parts	Beef scrap	11 Parts
Corn meal	73 Parts	Corn meal	73 Parts
Wheat bran	5 Parts	Wheat bran	5 Parts

The details of the test follow:

	lbs.		lbs.
Mash eaten	80		65
Grain eaten	214		137
Total feed	294		202
Cost of feed	$5.88		$4.04
Eggs laid in October	45		...
Eggs laid in November	37		3
Eggs laid in December	28		4
Eggs laid in January	47		20
Eggs laid in February	136		98
Eggs laid in March	98		75
Total eggs laid	396		200
Cost of feed per hen	$0.45		$0.58
Cost of producing an egg	$0.015		$0.02

The meal fed hen, it should be noticed, laid a few more eggs than the beef fed hen laid, and at a lower cost per egg.

The experiment with laying hens thus shows that cotton seed meal is an excellent feed for laying hens. In each test the hens fed cotton seed meal laid more eggs per hen than the hens fed beef scrap laid; and in each case they produced them at a lower cost. This was noticeably true during the fall molt.

COTTON SEED MEAL FOR BROILERS

The experiment in fattening broilers with cotton seed meal, like that in feeding layers, embraced two tests. In each of these sixteen choice Rhode Island Reds were used, eight to a pen. Great care was taken to make the test accurate. The pens were

made secure against birds going either in or out. The broilers were the same age and the same size. The rations fed were identical in composition with those fed the laying hens. The broilers were given all the mash they would eat and, late in the afternoon, all the mixed grain they would eat.

In the *First Test* the mash was composed thus:

Pen A.		Pen B.	
Cotton seed meal	11 Parts	Beef scrap	5½ Parts
Corn meal	50 Parts	Corn meal	50 Parts
Oats	29 Parts	Oats	29 Parts
Wheat bran	10 parts	Wheat bran	10 Parts

The details of the test follow:

	lbs.	lbs.
Mash eaten	13.5	20.
Grain eaten	5.12	3.5
Fat gained	3.56	4.5
Cost per lb. of gain, cts.	10.47	11.05

Though the broilers in B, beef fed, gained more in weight than those in A, meal fed, they did so at a greater cost per pound of gain.

In the *Second Test* the proportion of protein to mash was doubled. The composition was this:

Pen K.		Pen D.	
Cotton seed meal	22 Parts	Beef scrap	11 Parts
Corn meal	73 Parts	Corn meal	73 Parts
Wheat bran	5 Parts	Wheat bran	5 Parts

The results are these:

	lbs.	lbs.
Mash eaten	16.5	18.5
Grain eaten	3.5	2.5
Fat gained	4.44	3.5
Cost per lb. of gain, cts.	7.66	10.57

Unlike pen A, the cotton seed meal pen of the first test, pen K gained more weight than its check pen did; the increased amount of cotton seed meal apparently stimulated growth. Pen K, also, gained weight at a smaller cost per pound than D, the beef scrap pen, did.

The experiments indicate that cotton seed meal is a splendid feed for laying hens and for broilers. It is a good laying ration or a good fattening ration when it comprises 25 per cent or less of the mash feed.

GOOD RESULTS WITH WHOLE FLOCK

Experience with the general flock, it may be remarked incidentally, warrants the Station in recommending cotton seed meal in this quantity for these purposes. Pullets at this Station, it is furthermore interesting to note, grow rapidly and mature early and begin to lay early when fed a mash containing at first 15 per cent and, through gradual increase, finally 25 per cent of cotton seed meal. Fed in this way, many of our White Leghorn pullets have begun laying when only five months old and some of our Rhode Island Reds when only six or six and a half months old. Significant is a statement made in regard to the fattening of cattle, in Agricultural Copy Service 8, November 9, 1915, of the College of Agriculture, University of Missouri: "Cotton seed meal stimulates the appetite, thereby inducing rapid gains and a quick finish as well as assisting in maintaining the appetite when the animals are in high condition."

A larger percentage than 25 may or may not be advisable; the poultry department has not completed its experiments with feeds that are more than 25 per cent cotton seed meal. At present the department is conducting some experiments to discover what effects feeds that are 25 per cent to 40 per cent cotton seed meal have on laying hens. It is also discovering the cumulative effects of the meal, feeding it to the progeny of meal-fed hens. And the department is making tests to find out the effects of the meal, when 25 per cent to 40 per cent of the mash, on the fertility of eggs.

For the production of eggs, the Station recommends the following ration:

Cotton seed meal	25 Parts
Corn meal	30 Parts
Wheat bran	30 Parts
Wheat shorts	15 Parts

A little salt may be put into this ration; one pound to the hundred, is advisable.

This mash should be put into clean, dry hoppers in dry sheds. If the mash is dry, the hens will not eat too much of it. They should have access to it at all times.

A grain mixture also should be given the laying hens. This mixture may well be:

Corn	2 Parts
Wheat	2 Parts
Oats	1 Part

Other proportions are sometimes advantageous. In cold weather more corn and less oats may well be given. The following ration is good for winter feeding:

Corn	2 Parts
Wheat	2 Parts
Oats	1 Part

For summer feeding less corn and more wheat should be fed. The following ration is good:

Corn	1 Part
Wheat	2 Parts
Oats	2 Parts

The grain mixture should be fed twice a day. The amount to be given varies with the appetite of the hens; feeders, using good judgment, will give them more when the hens are hungry and less when indifferent. Usually, however, a pint of the mixture should be given to each ten hens in the early morning and a quart in the afternoon.

All grain should be thrown into straw that the hens must exercise, must work for their living.

Fresh water in clean vessels should be provided. Oyster shell, grit, and charcoal should be placed ready for the hens at all times.

For small chicks the mash provided for the hens should be modified. A few other elements should go into it. A good formula is this:

Cotton seed meal	15 Parts
Corn meal	35 Parts
Wheat bran	35 Parts
Wheat shorts	15 Parts
Fine charcoal	3 Parts
Bone meal	5 Parts
Grit	3 Parts

Several parts of rolled oats would improve this mash. But if the oats in bulk cost more than five cents a pound, they should be left out.

The mash should be put into shallow pans or hoppers placed where the chicks can feed at will. As long as it is dry, they will not eat too much. They will grow rapidly. Contrary to the opinion of many poultrymen cotton seed meal does no harm to growing chickens; it develops the little fellows fast by supplying the much needed protein.

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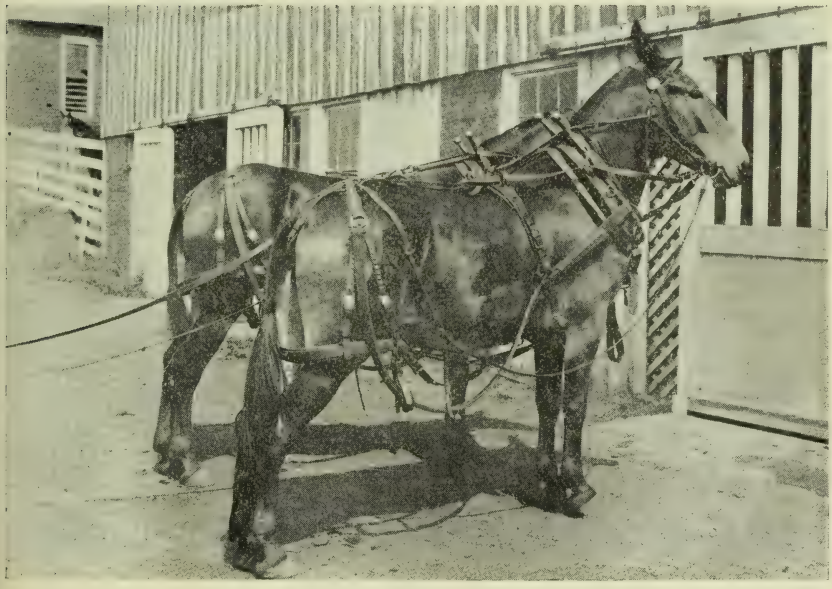
The Economy of Mule Production
in the South and
Methods of Management



By H. K. GAYLE AND E. R. LLOYD
Agricultural College, Miss.
April 1916

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* In co-operation with U. S. Department of Agriculture.

The Economy of Mule Production in the South and Methods of Management

By H. K. GAYLE AND E. R. LLOYD

INTRODUCTION

The farm value of horses and mules in the United States is greater than the combined value of beef cattle, sheep, and swine. In Mississippi the farm value of horses and mules is one and three-fifths times as great as the total value of all dairy cattle, beef cattle, sheep, and swine, the total value of mules in this State being one-third greater than the total value of horses.

A number of estimates have been made to determine what per cent of the number of mules in Mississippi have been bred and raised within the State and their average indicates that not more than 20 or 25 per cent of the mules now at work in the State were raised in Mississippi. This precentage would show between 220,000 and 230,000 mules at work on the farms of this State that were shipped into Mississippi from outside sources, this representing between $24,000,000 and $25,000,000 spent for mules that could and should have been raised within the State at a good profit to the farmers producing them.

It is a signficant fact that the most prosperous states of the Union are those states which are commonly looked upon as our livestock producing states. The permanent prosperity of any section can be fairly accurately measured by the relative number of livestock it is producing, and since this State has more money invested in horses and mules than in all other live stock combined, it becomes apparent that some study should be given to their production and management.

The statement is often made that the mule will do more work on a given amount of feed than the horse. Scientific data for the substantiation of this statement is lacking. However, it is generally agreed that the mule will stand hard work in hot weather better than the horse,

will stand more hard knocks and abuse, is freer from disease, longer lived, is less subject to lameness and digestive disorders, and is easier to handle in large bunches than the horse. For these reasons the mule has been practically the sole work animal for the Southern States, and in spite of the fact that in the last few years the use of farm tractors has increased rapidly, and will no doubt continue to increase, there is very little doubt but that for years to come the mule will continue to perform most of the operations on Southern farms.

This Station has for several years been conducting an experiment in the raising of mules, the object of which is:

First, To determine the economy of mule production under Mississippi conditions.

Second, To determine the best type of mare and jack for the production of good farm work mules.

Third, To study the relative hereditary influences of the jack and mare upon the mule produced.

The result of this work will be presented in this bulletin in such a way as to be of the most practical value to the farmer interested in the breeding and rearing of horses and mules. Data bearing on the more techincal phases of breeding and feeding will be given in later publications.

THE ECONOMY OF MULE PRODUCTION UNDER MISSISSIPPI CONDITIONS AND METHODS OF MANAGEMENT

Following is a table of the feeds used and their average market price throughout the State:

Cottonseed Meal	@ $30.00 per ton	$ .015	per lb.
Ear Corn	@ $ .75 per bu.	.0107	per lb.
Corn and Cob Meal	(ground for 5c per bu)	.0114	per lb.
Bran	@ $28.00 per ton	.014	per lb.
Oats	@ $ .55 per bu.	.0171	per lb.
Peanut cake	@ $24.00 per ton	.012	per lb.
Molasses	@ 12c per gal. of 12 lb.	.01	per lb.
Corn Silage	@ $3.00 per ton	.0015	per lb.
Johnson Grass Hay	@ $10.00 per ton	.005	per lb.
Peavine Hay	@ $12.00 per ton	.006	per lb.
Oat Straw	@ $5.00 per ton	.0025	per lb.

The mares used in the experiment were worked very little but were given free run of pasture while suckling colts and fed enough to keep them in good condition during the winter.

Starting with the mare after weaning her last colt, the mares are taken up from pasture about December 1st, each given a roomy box stall and fed twice daily. They have the run of open paddocks during the day, but at night and during inclement weather are kept in the stall.

The cost of wintering mares varies according to the weight of the mare and the feeds used. A ration of one pound of grain and one pound of hay per cwt., live weight, is a safe standard to follow. Oats and bran have been found too high in price to constitute a part of the ration for wintering a brood mare except near foaling time.

LOT 1, EXPERIMENT 1.

Two mares, averaging about 1000 lbs. in weight each, were wintered on a daily ration per mare of:

Ear corn	10 lbs.
Johnson Grass Hay	10 lbs.

These mares wintered in good shape at a cost to winter (120 days) of $18.84 per mare.

LOT 2, EXPERIMENT 1.

Five mares, averaging about 900 lbs. in weight each, were wintered on a daily ration per mare of:

Corn and cob meal	2 lbs.
Cottonseed meal	2 lbs.
Silage	8 lbs.
Johnson grass hay	10 lbs.

These mares wintered in good shape at a cost to winter (120 days) of $13.80 per mare.

LOT 1, EXPERIMENT 2.

Four Hackney mares, averaging about 1250 lbs. in weight each, were wintered on a daily ration per mare of:

Ear corn	6.3 lbs.
Cottonseed meal	.53 lbs.
Johnson grass hay	14.5 lbs.

These mares wintered in good shape at a cost to winter (120 days) of $17.76 per mare.

LOT 1, EXPERIMENT 3.

Five Percheron mares, averaging about 1425 lbs. in weight each, were wintered on a daily ration per mare of:

Ear corn	9.5 lbs.
Cottonseed meal	.5 lbs.
Johnson grass hay	17.1 lbs.

The cost of wintering these mares (120 days) was $23.16 per mare.

SILAGE

Silage has been successfully used for wintering brood mares and whenever used has lessened the cost of wintering the mare.

LOT 2, EXPERIMENT 2.

Seventeen light mares, averaging about 1100 lbs. in weight each, were wintered on a daily ration per mare of:

Ear Corn	5.6 lbs.
Cottonseed meal	1. lbs.
Silage	8. lbs.
Johnson grass hay	10. lbs.

These mares increased in weight about 50 lbs. each. The cost to winter (120 days) was $16.44 per mare.

LOT 2, EXPERIMENT 3.

Seventeen grade draft mares, averaging in weight 1300 lbs. each, were wintered on a daily ration per mare of:

Ear corn	7. lbs.
Cottonseed meal	1.5 lbs.
Silage	10. lbs.
Johnson grass hay	10. lbs.

These mares increased in weight over 50 lbs. per mare. The cost to winter (120 days) was $19.49 per mare.

THE SUCKLING COLT

It is desirable to have the colts dropped as early in the spring as possible. Not only will the colts make use of more feed and make a larger growth during the winter than if dropped late, but the mares will go into winter quarters in better shape and winter cheaper if some time is allowed to elapse between the time the colt is weaned and the time the mare is taken off pasture for the winter. During the month of March is a good time to have the colts dropped in this latitude.

Mares and colts are turned out to pasture about April 1st, and are allowed the freedom of good pasture together until October 1st,

when the colts are weaned and separated from the mares and the mares returned to pasture until December 1st.

THE WEANLING MULE COLT

When the colts are weaned October 1st, they are placed on a daily ration per colt of:

Corn and cob meal	.75 lbs.
Oats	1.5 lbs.

and run on a luxuriant pasture of winter oats until November 1st.

During this 30-day weaning period the colts will make an average gain of about 25 lbs. each, and will be on a full grain ration by November 1st.

It is very poor policy to economize on feed to a weanling or yearling mule colt. The mule at best is rather a poor grazer and a spare eater, and unless the colt is given all the palatable, nutritious feed it will consume, no matter how highly bred, it will never develop into anything more than an undersized, scrubby individual. The treatment a colt receives during the first two years of his life determines to a large extent his development, and for that reason he should receive only the best of care.

A weanling mule colt should receive at least 1 1-4 lbs. of grain and about 1 1-5 lbs. of hay per hundred weight of live weight as a daily ration.

Illustration showing the method of wintering mules in bunches under an open shed.

LOT 3, EXPERIMENT 1.

Five colts were fed 150 days on a daily ration per colt of:

Corn and cob meal	.5 lbs.
Cottonseed meal	1. lbs.
Silage	8. lbs.
Johnson grass hay	5. lbs.

This gave a ration equivalent to .33 lbs. of grain and 2 lbs. of hay per cwt. live weight, and the daily gain was only 6 lbs. per colt, the cost to winter being $8.55 per colt.

LOT 4, EXPERIMENT 1.

Four colts were fed 150 days on a daily ration per colt of:

Ear corn	2.5 lbs.
Cottonseed meal	1. lbs.
Johnson grass hay	6. lbs.

This gave each colt a ration of 6 lbs. grain and 1.1 lbs. hay per cwt. live weight, and the daily gain was only .56 lbs. per colt, the cost to winter being $10.80 per colt.

LOT 3, EXPERIMENT 2.

Five colts were fed 150 days on a daily ration per colt of:

Ear corn	2 lbs.
Oats	2 lbs.
Peavine hay	6 lbs.

This gave a ration of .8 lbs. grain and 1.2 lbs. hay per cwt. live weight, and the gain per colt was .67 lbs. per day. The cost to winter was $13.59 per colt.

LOT 3, EXPERIMENT 3.

Nine colts were fed 150 days on a daily ration per colt of:

Corn and cob meal	2 lbs.
Oats	2 lbs.
Bran	1 lb.
Cottonseed meal	1 lb.
Johnson grass hay	5 lbs.

This gave a daily ration per colt of 1.2 lbs. grain and 1 lb. hay per cwt. live weight, and the daily gain was 1 lb. per colt, which is a fairly good gain for a weanling colt. The cost to winter was $16.50 per colt.

Silage can be fed successfully to the weanling colt provided it is sweet, clean, and free from mold. Cottonseed meal has been used in most rations because it furnishes a cheap and easily available source of protein which becomes so necessary to the growing colt when a roughage like Johnson grass hay is fed. It has been noticed, however, that a ration containing cottonseed meal is not as palatable as one in which the cottonseed meal has been displaced with wheat bran, and further that the colts on the bran ration will take more feed and make larger growth than those getting cottonseed meal.

LOT 4, EXPERIMENT 3.

Six colts were fed 150 days on a daily ration per colt of:

Cottonseed meal	1 lb.
Corn and cob meal	3 lbs.
Oats	3 lbs.
Silage	10 lbs.
Johnson grass hay	3 lbs.

The average weight of these colts November 1st was 540.8 lbs., and on April 1st, 703 lbs., making an average gain per mule of 137 lbs., or a daily gain of 1.14 lbs. per colt. This gave a daily ration equivalent to 1.25 lbs. grain and 1.33 lbs. hay per cwt. live weight. The cost of wintering each colt was $18.35.

LOT 5, EXPERIMENT 3.

Six colts were fed 150 days on a daily ration per colt of:

Bran	2 lbs.
Corn and cob meal	3 lbs.
Oats	3 lbs.
Silage	10 lbs.
Johnson grass hay	3 lbs.

The average weight of these colts November 1st was 532.6 lbs. per colt, and on April 1st was 716.4 lbs., showing a gain of 183.8 lbs. per mule, or a daily gain of 1.22 lbs. per mule. This ration gave each colt the equivalent of 1.5 lbs. grain and 1.5 lbs. hay per cwt. live weight. The cost to winter each colt was $19.80.

THE YEARLING MULE

The colts are turned out about April 1st and are run on good pasture until November 1st. They are then taken up and fed a good growing ration until pasture time again, it being just as necessary to keep the yearling colt growing as it is the weanling.

LOT 5, EXPERIMENT 1.

Two rather small yearling colts were fed 150 days on a daily ration per mule of:

Ear corn	5 lbs.
Johnson grass hay	5 lbs.

The average gain per colt was only 25 lbs., or .17 lbs. per day, and the cost to winter was $12.00 per mule.

LOT 4, EXPERIMENT 2.

Six yearling mules were fed 150 days on a daily ration per mule of:

Ear corn	3.33 lbs.
Peanut cake	3. lbs.
Johnson grass hay	5. lbs.

These colts made an average daily gain per colt of .58 lbs. The cost to winter was $14.40 per colt.

LOT 6, EXPERIMENT 3.

Nine yearling colts were fed 150 days on a daily ration per colt of:

Corn and cob meal	6 lbs.
Molasses	2 lbs.
Cottonseed meal	1.75 lbs.
Johnson grass hay	8 lbs.

These colts made an average daily gain of .8 lbs. per colt, and the cost to winter each colt was $23.19. This gave to each colt a daily ration of 1.33 lbs. of grain and 1.1 lbs. of hay per cwt. live weight.

THE TWO YEAR OLD MULE

At pasture time, April 1, the colt is again turned to pasture until December 1, when he is put to work or wintered again on a ration sufficient to keep him in good condition until put to work in the spring as a three-year-old.

LOT 6, EXPERIMENT 1.

Ten two and three year old mules were fed 120 days on a daily ration per mule of:

Corn and cob meal	2 lbs.
Cottonseed meal	2 lbs.
Johnson grass hay	10 lbs.

This was found to be just a maintenance ration for mules averaging 765 lbs. in weight. The above ration gave each mule .52 of a pound of grain and 1.3 pounds of hay per cwt. live weight. The cost to winter each mule 120 days was $12.33.

LOT 5, EXPERIMENT 2.

Eleven two-year old mules were fed 120 days on a daily ration per mule of:

Corn and cob meal	4 lbs.
Cottonseed meal	2 lbs.
Silage	10 lbs.
Oat straw	8 lbs.

The gain per mule was .45 lbs. per day, and the cost to winter (120 days) was $13.20 per mule. The mules averaged 814 lbs. in weight, and received the equivalent of .73 lbs. of grain and 1.6 lbs. of hay per cwt. live weight.

LOT 7, EXPERIMENT 3.

Nine two-year-old mules were fed 120 days on a daily ration per mule of:

Corn and cob meal	6 lbs.
Cottonseed meal	2 lbs.
Corn silage	10 lbs.
Johnson grass hay	6 lbs.

These mules made an average daily gain of .72 lbs. each and received the equivalent of 1 lb. of grain and 1.37 lbs. of hay per cwt. of live weight. The cost to winter (120 days) was $17.20 per mule.

PASTURE

The average pasture land throughout the State rents for about $1.00 per acre, and of such land two acres will pasture a mare and colt during the pasture season. Two acres are also allowed for each mule one year old or over during pasture time.

SUMMARY

The results given have been grouped under three separate experiments: Experiment 1. Experiment 2. and Experiment 3. Three distinct classes of mules have been produced.

EXPERIMENT 1.

The class of mule produced under Experiment 1 is typical of the small, light mule standing 14½ hands high and weighing 800 pounds. This class of mule is represented in great number throughout the South, especially in the upland or hilly sections. The results of Experiment 1 show the cost of producing such a mule under conditions similar to those of Mississippi to be:

To wintering mare (average)	$16.34
To pasturing mare and foal	2.00
To wintering weanling colt (average)	9.65
To pasturing yearling	2.00
To wintering yearling (average)	12.00
To pasturing 2 year old	2.00
To wintering 2 year old (average)	12.33
To jack fee	10.00
Total	$66.32

Such a mule if bought on the open market will cost $125.00.

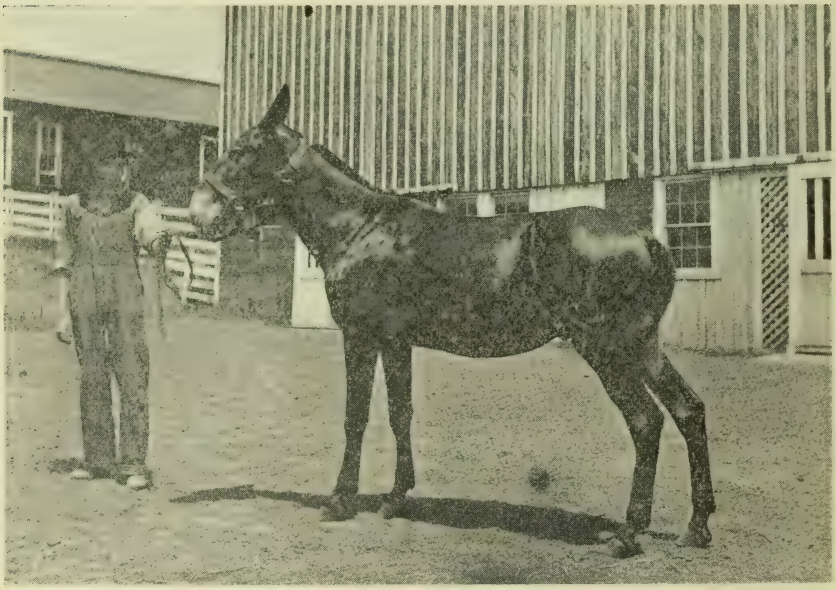
Experiment 1. Lighter type of "cotton mule" standing 14½ hands high and weighing 800 pounds. This mule ordinarily sells for $125.00. The average cost of raising such a mule to a three year old under Mississippi conditions is $66.32.

The type of mule produced under Experment 2 is commonly known as the "cotton mule." This mule stands 15½ to 15¾ hands high and weighs around 1100 pounds.

The results of Experiment 2 show the cost of producing the "cotton mule" under Mississippi conditions to be:

To wintering mare (average)	$17.10
To pasturing mare and foal	2.00
To wintering weanling colt (average)	13.59
To pasturing yearling	2.00
To wintering yearling (average)	14.40
To pasturing 2 year old	2.00
To wintering 2 year old (average)	13.20
To jack fee	10.00
Total	$74.29

Such a mule if bought on the open market would cost between $140.00 and $160.00.



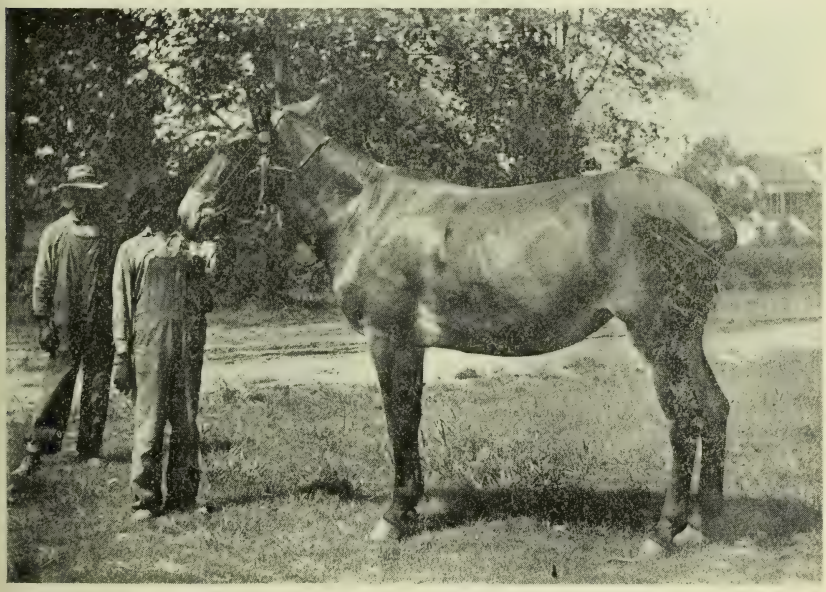
Experiment 2. Typical "cotton mule," weighing 1100 pounds and standing 15½ hands high. This mule ordinarily sells for between $140.00 and $160.00. The average cost of producing this mule at the Mississippi Experiment Station has been $76.29.

The type of mule produced under Experiment 3 is better adapted to average farm work where modern farm machinery is in use, demanding a mule of draft ability but at the same time a mule with life and stamina. Mules of this class would average 16 hands in height and 1200 pounds to 1250 pounds in weight.

The results of Experiment 3 show the cost of producing a good general purpose farm mule to be:

To wintering mare (average)	$21.82
To pasturing mare and foal	2.00
To wintering weanling colt (average)	18.21
To pasturing yearling	2.00
To wintering yearling (average)	23.19
To pasturing 2 year old	2.00
To wintering 2 year old (average)	17.20
To jack fee	10.00
Total	$96.42

Such a mule if bought on the open market would cost between $180.00 and $225.00.



Experiment 3. A 16 hand 1250 pound farm work mule ordinarily selling for around $200.00 on the open market. The average cost of raising this class of mule at the Mississippi Experiment Station has been $96.42.

NET PROFIT OF MULE PRODUCTION
INTEREST ON ALL MONEY INVESTED AND DEPRECIATION OF MARE CONSIDERED

The maintenance of the brood mare during those years she does not bring a colt is not considered. During such periods she takes the place of a mule at work until she begins to show heavy with foal.

No account has been taken in the preceeding tables of the interest on the money invested nor the depreciation in the value of the brood mare. Under average farm conditions the mare is worked enough during the year to easily offset this item. Where the mare does no work at all during each year she raises a colt, however, the interest on all money invested and depreciation of the original investment must be included in the cost of production of each mule.

EXPERIMENT 1.

Small native mares of the type used in producing the light class of mule can be bought for about $100.00 each.

COST OF PRODUCING MULE

To average cost of wintering mare, including interest @ 8% for 3 years and 4 months	$20.68
To pasturing mare and foal, including interest @ 8% for 3 yrs	2.48
To average cost of wintering weanling colt, including interest @ 8% for 2 years and 5 months	11.52
To pasturing yearling, including interest @ 8% for 2 years	2.32
To average cost of wintering yearling, including interest @ 8% for 1 year and 5 months	13.36
To pasturing 2 year old, including interest @ 8% for 1 year	2.16
To average cost of wintering 2 year old, including interest @ 8% for 4 months	12.66
To jack fee, including interest @ 8% for 4 years	13.20
To 8% interest on money invested in a $100.00 mare for 1 year	8.00
To 10% depreciation of value of mare yearly	10.00
Total	96.38
Value of mule on open market	125.00
Net profit per mule	28.62

EXPERIMENT 2.

The average mare used in the production of the "cotton mule" is a mare weighing about 1100 pounds and selling for about $150.00.

COST OF PRODUCING MULE

To average cost of wintering mare, including interest @ 8% for 3 years and 4 months	$21.66
To pasturing mare and foal, including interest @ 8% for 3 years	2.48
To average cost of wintering weanling colt, including interest @ 8% for 2 years and 5 months	16.22
To pasturing yearling, including interest @ 8% for 2 years	2.32
To average cost of wintering yearling, including interest @ 8% for 1 year and 5 months	16.03

To pasturing 2 year old, including interest @ 8% for 1 year	2.16
To average cost of wintering 2 year old, including interest @ 8% for 4 months	13.55
To jack fee, including interest @ 8% for 4 years	13.20
To 8% interest on $150.00 invested in mare for 1 year	12.00
To 10% depreciation of value of mare yearly	15.00
Total	114.62
Value of mule on open market	150.00
Net profit per mule	35.38

EXPERIMENT 3.

The average mare used in the production of the better class farm work mule is a 1200 or 1300 pound mare selling for about $175.00.

COST OF PRODUCING MULE

To average cost of wintering mare, including interest @ 8% for 3 years and 4 months	$27.63
To pasturing mare and foal, including interest @ 8% for 3 years	2.48
To average cost of wintering weanling colt, including interest @ 8% for 2 years and 5 months	21.74
To pasturing yearling, including interest @ 8% for 2 years	2.32
To average cost of wintering yearling, including interest @ 8% for 1 year and 5 months	25.83
To pasturing 2 year old, including interest @ 8% for 1 year	2.16
To average cost of wintering 2 year old, including interest @ 8% for 4 months	17.66
To jack fee including interest @ 8% for 4 years	13.20
To 8% interest on $175.00 invested in mare for 1 year	14.00
To 10% depreciation of mare yearly	17.50
Total	144.52
Value of mule on open market	200.00
Net profit per mule	55.48

CONCLUSION

Charging interest on all money invested @ 8% and 10% depreciation in the value of the brood mare yearly, and valuing all feeds used at their average market value, mules are still produced at a good profit; the small mule at a profit of $28.62 per head, the "cotton mule" at a profit of $35.38 per head, and the heavy work mule at a profit of $55.48 per head.

The farmer who can give the brood mare enough work to pay for her keep and depreciation can raise mules in the South for less than one-half their cost on the open market.

Where the cost of keeping the mare must be included but no account taken of the interest on the money invested or her depreciation in value, the small type mule can be produced in the South for two-thirds his market value, the "cotton mule" for slightly over one-half his market value, and the better grade farm mule for less than one-half his market value.

AVAILABLE BULLETINS AND CIRCULARS

The following bulletins and circulars of the Station may be had upon request:

BULLETINS

139—Boll Weevil in Mississippi, 1909.
140—Cotton Diseases in Mississippi.
141—Control of Diseases of Fruits, Vegetables and Flowers.
145—Inspection and Analyses of Commercial Feeding Stuffs.
146—Suggestions for Growing Home Fruits.
147—Apple Growing in Mississippi.
148—Inspection and Analyses of Cottonseed Meal.
149—Inspection and Analyses of Commercial Feeding Stuffs.
150—Inspection and Analyses of Commercial Fertilizer.
151—Inspection and Analyses of Cottonseed Meal.
152—Inspection and Analyses of Commercial Feeding Stuffs.
153—Inspection and Analyses of Commercial Feeding Stuffs.
154—Inspection and Analyses of Commercial Feeding Stuffs.
155—Recent Cotton Experiments.
156—Inspection and Analyses of Cottonseed Meal.
159—Clearing Pine Lands.
160—The Cut-Over Lands of South Mississippi.
161—Cotton Experiments, 1912.
162—Cottonseed Meal as a Feed for Laying Hens.
163—Truck Crops for South Mississippi.
164—Cotton Experiments, 1913.
165—Report of the Work Done at Holly Springs Branch Experiment Station, 1913.
166—Dairying on Cut-over Pine Lands.
167—Corn Silage Compared with Hulls for Fattening Steers.
168—Bacteriological Effects of Green Manures.
169—Cotton Experiments, 1914.
170—Corn.
172—Forage Crops.
173—Cotton Experiments, 1915.
Technical Bulletin No. 2—Some Scale Insects of Mississippi.
Technical Bulletin No. 3—Form and Structure of Certain Plant Hybrids in Comparison with the Form and Structure of their Parents.
Technical Bulletin No. 4—The Soils of Mississippi.
Technical Bulletin No. 5—Sero-Diagnosis of Pregnancy in Mares.
Technical Bulletin No. 6—Forage Poisoning Due to Claviceps Paspali on Paspalum.

CIRCULARS

Underground Waters of Mississippi.
Report of Work on Alfalfa at Holly Springs Branch Experiment Station.
Diseases Prevalent Among Horses and Cattle in Mississippi.
Mississippi Poultry House.
Express Cotton.

Bulletin No. 177 August, 1916

Some Experiments and Practical Demonstrations in Hog Feeding at the Delta Branch Experiment Station

By G. B. Walker

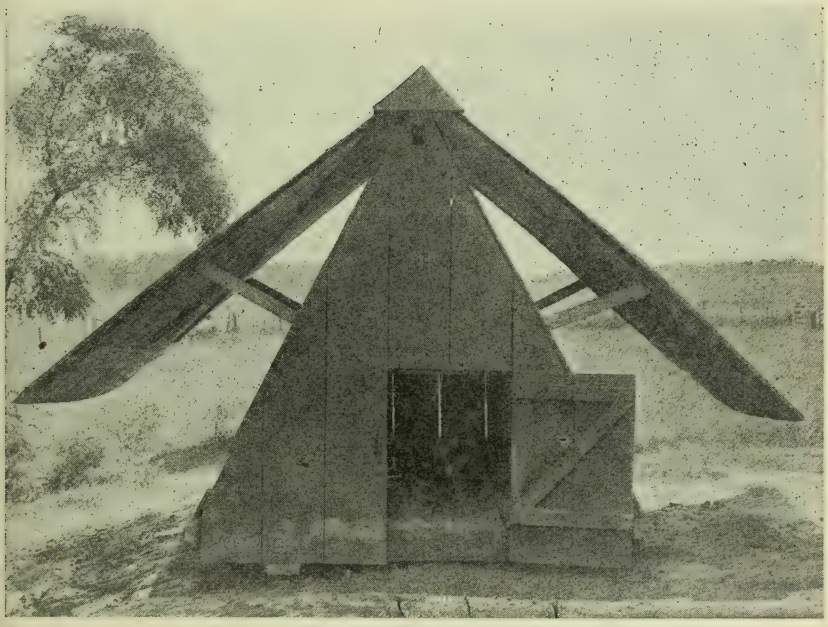


Fig. 1.—Mississippi Hog House.

This house provides comfort for hogs both winter and summer.

MISSISSIPPI AGRICULTURAL EXPERIMENT STATION

AGRICULTURAL COLLEGE, MISS.

Some Experiments and Practical Demonstrations in Hog Feeding at the Delta Branch Experiment Station

This bulletin gives the results of some of the work done with hogs at the Delta Branch Station, during 1914 and 1915, and offers some practical suggestions to the Delta planter who wishes to raise a few hogs on the plantation each season.

Even on the rich Delta soils, where cotton is the all-important crop, the hog has a place. It is necessary to grow some legumes to aid in keeping up soil fertility. To properly utilize these leguminous crops and the waste product of the farm, some live stock of the meat producing class must be kept. For these purposes swine should receive the consideration of every planter. A herd of swine can utilize a majority of the waste products of the farm more economically than any other meat producing animal. Swine multiply more rapidly than any other meat producing stock. A herd, furthermore, can be started with less outlay of capital and can be fed and marketed more economically than any other meat producing animal.

The production of pork, whether on the large Delta plantation or on the small hill farm, is, however, usually profitable or unprofitable, according to the feed provided and the method used in feeding it. It is hoped that the experimental results given and the suggestions offered in this bulletin will prove of value to those interested in the hog.

EXPERIMENT No. 1.

Object of the Experiment.

The object of Experiment No. 1 was to determine the value of alfalfa pasture alone, as a feed for pigs, as compared with alfalfa pasture and a full ration of corn. By a full ration of corn is meant all the pigs would eat up clean once a day.

Plan of the Experiment.

On May 25, 1914, six uniform pigs were selected from the station herd, weighed, tagged, and divided into two lots of three each.

Lot No. 1, averaging 58 pounds each, were turned on a field of alfalfa, where they had access to plenty of shade, water and salt, but no grain whatever.

Lot No. 2, averaging 57 pounds each, were allowed to run on the alfalfa pasture only during the late afternoon, night, and early morning. About eight o'clock in the morning they were turned into a lot, where they remained during the hot hours of the day. In this lot they had access to shade, water, salt, and all the shelled corn they would eat up clean.

Both lots were weighed at the beginning of the experiment and at the end of each thirty days.

All the pigs in both lots were in the experiment ninety days. They remained in a thrifty condition throughout the period.

The following table gives the record of gains made, and feed consumed during the ninety-day test:

Table No. 1.

ALFALFA PASTURE VS. ALFALFA PASTURE AND FULL RATION OF CORN.

	Lot No. 1.	Lot No. 2.
Average initial weight	58 lbs.	57 lbs.
Average final weight	111 lbs.	171 lbs.
Average daily gain	.59 lbs.	1.26 lbs,
Value of gain	$3.71	$7.98
Average corn consumed		221 lbs.
Average price paid for alfalfa pasture, when gain is 7 cents per pound	$3.71	*$5.22

* Arrived at by deducting value of corn consumed at 70 cents per bushel, from value of gain at 7 cents per pound.

The foregoing table indicates that it is both advisable and profitable to feed a rather liberal ration of grain to pigs on alfalfa pasture if they are not to be made ready for market at the earliest possible age. Although Lot No. 1, which received no grain, made fair gains and stayed in a thrifty condition throughout the ninety days, the increase in gain made by Lot No. 2, which received a liberal ration of corn, is too great to justify leaving off the corn, even if it has to be bought at a good price.

If alfalfa pasture is worth $3.71 per head for ninety days grazing, as shown by results from Lot No. 1, it is not advisable to leave off corn, even at $1.00 a bushel.

By charging the pigs in Lot No. 2, $3.71 per head for alfalfa pasture, the value as indicated by Lot No. 1, and by giving corn credit for rest of gain, we find that each pig in Lot No. 2 paid the difference

between $3.71 and $7.98, or $4.27 for 221 pounds of corn, or $1.23 per bushel.

At the end of the ninety days test, the pigs in Lot No. 2 were practically finished; those in Lot No. 1 were rather lean and would have required at least thirty days of feeding to have put them in the same shape as those in Lot No. 2.

Fig. 2.—Pigs Grazing Alfalfa.

For summer hog pasture alfalfa has been found to excel all other crops at the Delta Station.

EXPERIMENT No. 2.

Object of the Experiment.

The object of experiment No. 2 was to determine the value of a copperas solution in preventing cottonseed meal injury to hogs and to discover the effect of the solution on gains.

Tests were made in both 1914 and 1915. The results were so varying that no definite conclusions can be drawn from them. We give the details for what they may be worth.

Plan of the Experiment.

In May of 1914, six three-months-old pigs were selected from the station herd, and divided into two lots of three pigs each.

The pigs in Lot No. 1, averaging 71 pounds in weight, were given a ration composed of shelled corn three parts and cottonseed meal one

part by weight; both the corn and the cottonseed meal were fed dry twice a day.

The pigs in Lot No. 2, averaging 76 pounds, were given a ration of shelled corn three parts and cottonseed meal one part. In addition they were given a gallon of a copperas solution for each pound of cottonseed meal received. The copperas solution was made by dissolving one pound of copperas in fifty gallons of water.

All the pigs were kept in dry lots, where they had access to shade, water, and salt.

The following table gives the significant details of the test:

Table No. 2.

	Lot No. 1.	Lot No. 2.
Average initial weight	71 lbs.	76 lbs.
Average final weight	178.33 lbs.	164 lbs.
Average gain in ninety days	107.33 lbs.	88 lbs.
Average pounds corn consumed	267 lbs.	286 lbs.
Average pounds cottonseed meal consumed	87 lbs.	92 lbs.
Cost of gain when corn is 70 cents per bushel and cottonseed meal $25.00 per ton	$4.14	$5.36

In the foregoing test, none of the pigs showed any evidence of injury from eating cottonseed meal, and all went through the ninety-day test apparently in fine shape. The test, therefore, failed to discover any value in the copperas solution as a preventive of cottonseed meal poisoning. On the contrary it apparently indicated that the solution did harm; it can be seen, however, that the pigs in Lot No. 2, which received the copperas solution, failed to make gains as good as those made by the pigs in Lot No. 1, and they put on their flesh at an expense of $1.22 greater than that required by the pigs fed on dry corn and meal—$5.36 against $4.14.

During 1915, three tests to determine value of copperas in preventing cottonseed meal poisoning in pigs, were made. In none were accurate records kept of the cost of the gains obtained; particular attention was paid only to the injurious effects of the cottonseed meal, and to the preventive or alleviating effect of the copperas solution.

The plan of the first was that of the test made in 1914. Two lots of three pigs each got their feed from the trough twice a day. Lot No. 1 got dry corn and cottonseed meal; Lot No. 2 got corn and cottonseed meal soaked in the copperas solution. Both lots got three parts by weight of corn to one part of cottonseed meal.

All three pigs in Lot No. 1, which received no copperas, remained in good shape and made good gains up to the forty-second day, when one of them failed to eat. On the morning of the forty-third day it

was found dead. The other two remained apparently in good shape until the eighty-first day, when one was found dead. The third pig lived through the entire period of ninety days apparently in good shape and made a fair gain, an average of .70 of a pound a day.

All the pigs in Lot No. 2, which received the copperas, lived through the ninety-day period and made a slightly better average daily gain than the pigs in Lot No. 1 made—.71 of a pound.

The second test was made on same plan as first, except that Lot No .1 (the pigs getting dry feed) ate from a self-feeder instead of from a trough.

All the pigs of Lot No. 1 did well until the forty-third day, when one was found dead. The other two showed no signs of injury, and finished the ninety-day test in good shape apparently, making an average daily gain of one pound.

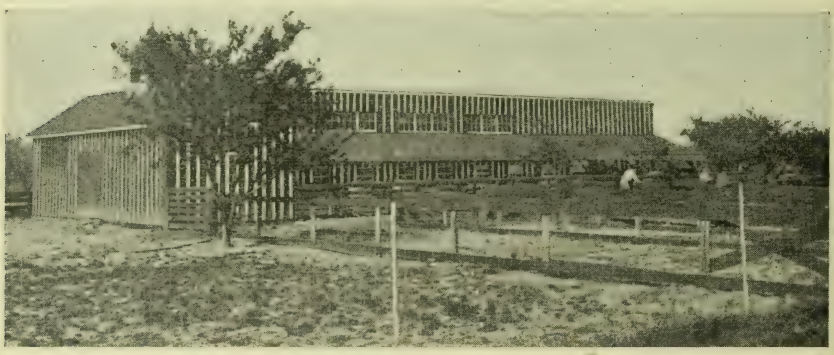


Fig. 3.—Hog Barn at Delta Branch Station.

All the pigs in Lot No. 2, which received the copperas, went through the ninety-day test in good shape and made an average daily gain of 1.03 pounds.

The third test was on the same plan of the second, except that the pigs—of both lots—were allowed to graze alfalfa at night.

All the pigs went through the ninety-day test in fairly good shape, none of the pigs in either lot showing any marked evidence of injury from the cottonseed meal. Those in Lot No. 1 gained an average of 1.30 pounds per day; those in Lot No. 2, getting copperas, gained an average of only 1.16 pounds per day.

Summary of the Experiment.—In two of the four lots fed corn and cottonseed meal dry, death resulted; in two, neither death nor

noticeable injury occurred. In none of the four lots given copperas did death or injury occur.

In the 1914 test and in the third 1915 test, in which the pigs grazed on alfalfa, neither death nor noticeable injury resulted to any lot. In these tests the best gains were made by the pigs getting no copperas.

In the other two tests, in which the pigs had no grazing and in which deaths resulted, the best gains were made by the pigs receiving copperas.

Both the copperas and the grazing apparently had some effect in preventing or alleviating the injury from cottonseed meal. The data, however, are not sufficient to warrant a definite conclusion.

EXPERIMENT No. 3.

The following is a record of three tests made in 1915, in which self-feeding is compared with hand-feeding.

Test No. 1.

In Test No. 1 six eight-months-old pigs were taken and divided into two lots of three pigs each. Lot No. 1 was fed in a trough, twice a day, a ration made up of corn and tankage, balanced according to a feeding standard. Lot No. 2 got corn and tankage from a self-feeder. The corn and the tankage were put into separate compartments.

The object in using rather old pigs was to compare cost of gains made by these pigs with the cost of gains made by younger pigs to be used in a future test, the test to run ninety days.

Both lots were kept in dry lots and given access to shade, water, salt and charcoal.

The results follow in Table No. 3.

Table No. 3.

NINETY-DAY TEST—USING CORN AND TANKAGE.

	Lot No. 1. Hand-Fed	Lot No. 2. Self-Fed
Average initial weight	150 lbs.	158 lbs.
Average final weight	286 lbs.	301 lbs.
Average gain	136 lbs.	143 lbs.
Average daily gain	1.51 lbs.	1.58 lbs.
Pounds corn consumed per pig	676 lbs.	562 lbs.
Pounds tankage consumed per pig	67.33 lbs.	46 lbs.
Average cost 100 pounds gain when corn is worth 70 cents per bushel and tankage $50.00 per ton	$ 7.45	$ 5.71
Average value of pigs at beginning of test at 6 cents per pound	9.00	9.48

TABLE No. 3.—(Continued.)

	Lot No. 1. Hand-Fed.	Lot No. 2. Self-Fed.
Value of feed consumed per pig.....	$10.13	$ 8.17
Average total cost per pig.....	19.13	17.65
Average value of pigs at close of test at 7½c per pound	21.45	22.57
Average profit per pig, not figuring cost of care....	2.12	4.92
Average profit per pig when cost of care is figured; 25 hours at 12½ cents in case of hand-fed lots, and 10 hours at 12½c in case of self-fed lots	1.07	4.50

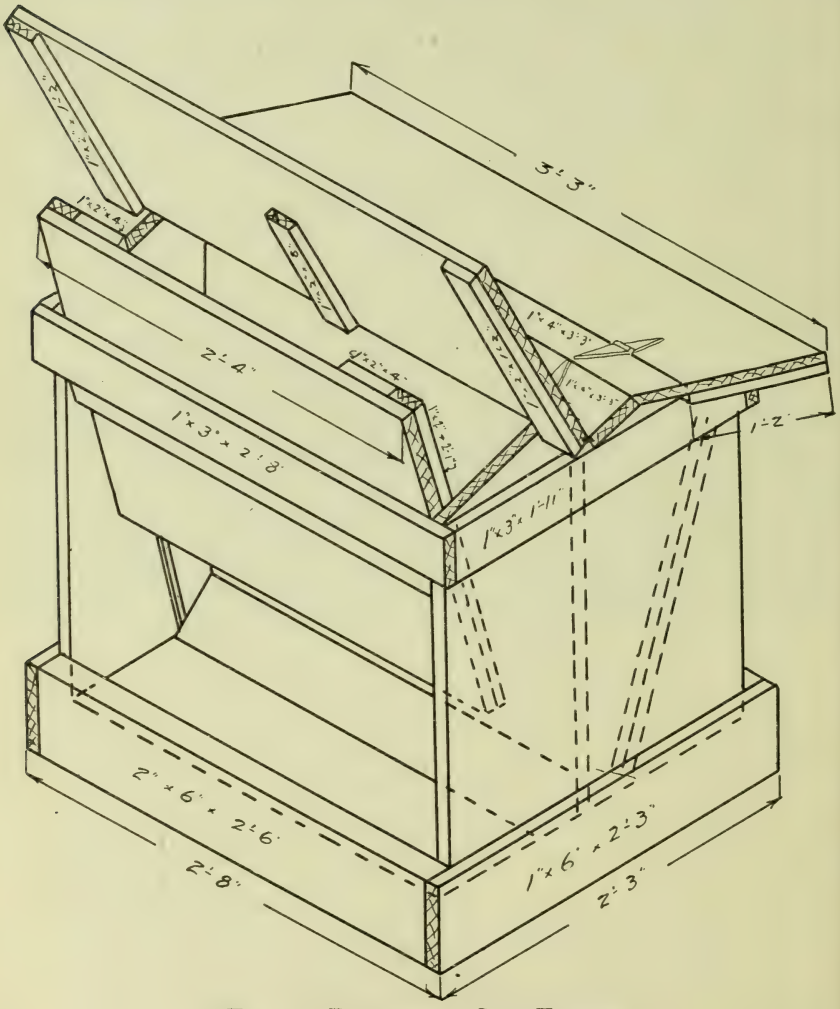


*Fig. 4.—PLAN FOR A SELF-FEEDER.

By means of the self-feeder, the hogs balance their own ration and labor is saved in feeding.

* Credit due Iowa State College.

Test No. 2.

The plan of Test No. 2 was the plan of Test No. 1, except that younger pigs were used, and the duration was seventy-five days, instead of ninety days. The results follow in Table No. 4.

Table No. 4.

Seventy-Five Day Test—Using Corn and Tankage	Lot No. 1. Hand-Fed	Lot No. 2. Self-Fed
Average initial weight	102 lbs.	100 lbs.
Average final weight	218 lbs.	236 lbs.
Average gain	116 lbs.	136 lbs.
Average daily gain	1.54 lbs.	1.81 lbs.
Pounds corn consumed per pig	392 lbs.	346 lbs.
Pounds tankage consumed per pig	35 lbs.	31 lbs.
Cost of 100 pounds gain when corn is worth 70 cents per bushel, and tankage $50.00 per ton	$ 5.00	$ 3.73
Average value of pigs at beginning of test at 6 cents per pound	6.12	6.00
Value of feed consumed per pig	5.70	5.10
Average total cost per pig	11.82	11.10
Average value of pigs at close of test at 7½ cents per pound	16.35	17.70
Average profit per pig, not figuring cost of care	4.53	6.60
Average profit per pig, considering care; 21 hours at 12½c in case of hand-fed, and 8 hours in case of self-fed	3.66	6.27

The plan of Test No. 3 was the plan of Test No. 2, except that cottonseed meal was substituted for tankage, and the duration was only sixty days. The results follow in Table No. 5.

Table No. 5.

Sixty-Day Test—Using Corn and Cottonseed Meal	Lot No. 1. Hand-Fed	Lot No. 2. Self-Fed
Average initial weight	99 lbs.	101 lbs.
Average final weight	205 lbs.	212 lbs.
Average gain	106 lbs.	111 lbs.
Average daily gain	1.76 lbs.	1.85 lbs.
Pounds corn consumed per pig	341 lbs.	299 lbs.
Pounds cottonseed meal consumed per pig	68 lbs.	57 lbs.
Average cost of 100 pounds of gain when corn is worth 70 cents per bushel, and cottonseed meal $25.00 per ton	$ 4.82	$ 4.00
Average value of pigs at beginning of test at 6 cents per pound	5.94	6.06
Value of feed consumed per pig	5.11	4.45
Average total cost per pig	11.05	10.51
Average value of pigs at close of test at $7.50 per 100 pounds	15.32	15.88
Average profit per pig, not figuring cost of care	4.27	5.37
Average profit per pig, considering cost of care; 17 hours at 12½ cents in case of hand-fed lot, and 7 hours in case of self-fed lot	3.60	5.08

In all three tests the self-fed lots made better gains and consumed less feed than the hand-fed lots. Even when the cost of care is not considered, the profit per pig of the self-fed lot was greater than the profit per pig of the hand-fed lot; in the first test, $2.80 greater; in the second, $2.07 greater; and in the third, $1.10 greater. When the cost of care is included, the difference in favor of self-feeding is even greater; in the first case, $3.43; in the sceond, $2.60; and in the third, $1.48.

In the first test the difference in cost of 100 pounds gain was $1.74 in favor of the self-fed lot; in the second test, $1.27; and in the third test, $0.82.

The self-feeder is desirable in that it saves five-sixths the time required by the old method of feeding two or more times a day in a trough.

It is desirable in that it insures better and cheaper gains.

It is desirable in that, when kept filled with right feeds, it makes possible better and thriftier animals; at all times the pigs get the different elements the body needs, in the right proportion.

It is desirable in that it enables every man to feed a properly balanced ration to his pigs at all times.

Fig. 5.—A Field of Soy Beans.

Excellent pasture for hogs when supplemented with corn.

EXPERIMENT No. 4.

The following experiment was made to determine whether or not a corn and alfalfa pasture ration could be benefited by the addition of a protein concentrate, and, if so, whether it would best be supplied from tankage or from cottonseed meal.

The plan of the experiment was to take nine pigs and divide them into three lots of three pigs each.

Lot No. 1 received corn in the self-feeder on alfalfa pasture.

Lot No. 2 received corn and tankage in the self-feeder on alfalfa pasture.

Lot No. 3 received corn and cottonseed meal in the self-feeder on alfalfa pasture.

The test ran ninety days. The results are given in the following table:

Table No. 6.

NINETY DAY TEST.	Lot No. 1. Corn on Alfalfa Pasture	Lot No. 2. Corn and Tankage on Alfalfa Pasture	Lot No. 3. Corn and Cottonseed Meal on Alfalfa Pasture
Average initial weight	52 lbs.	52 lbs.	52 lbs.
Average final weight	170 lbs.	174 lbs.	165 lbs.
Average gain	118 lbs.	122 lbs.	113 lbs.
Average daily gain	1.31 lbs.	1.35 lbs.	1.25 lbs.
Average pounds corn consumed	320 lbs.	308 lbs.	312 lbs.
Average pounds cottonseed meal consumed	0	0	9 lbs.
Average pounds tankage consumed	0	13 lbs.	0
Value of gain per pig at 7c per pound	$ 8.26	$ 8.54	$ 7.91
Cost of 100 pounds gain, not figuring pasture, when corn is worth 70 cents per bushel, cottonseed meal $25.00, tankage $50.00 per ton	3.39	3.42	3.54
Average value of pigs at beginning of test at 6 cents per pound	3.12	3.12	3.12
Value of feed consumed per pig, charging $1.00 per pig for ninety days grazing	5.00	5.17	5.00
Average total cost per pig	8.12	8.29	8.12
Average value per pig at close of test, at 7½ cents per pound	12.75	13.05	12.37
Average profit per pig, not figuring cost of care	4.63	4.76	4.25

It will be noticed from the foregoing table that the cost of 100 pounds of gain in the case of corn and alfalfa, was $3.89; in the case of corn, tankage and alfalfa, $3.42; and in that of corn, cottonseed meal and alfalfa, $3.54. The addition of tankage to the corn and alfalfa ration thus cost three cents per hundred pounds of gain; the addition of cottonseed meal, fifteen cents. We find also that the addition of tankage increased the profits thirteen cents per pig; that the addition of cottonseed meal decreased the profits thirty-eight cents per pig.

One would conclude from the above test (1) that corn in a self-feeder, on alfalfa pasture, is about as good a ration as can be had, and (2) that the addition of tankage increases the profits too little to justify its use under such conditions.

EXPERIMENT No. 5.

On some of the Delta plantations the supply of corn sometimes runs short just when the price is highest. Since black-strap molasses has about the same composition pound for pound as corn, and usually is a little below corn in price, the following test was made to determine whether or not it could be substituted wholly for corn in feeding hogs.

In August of 1915, six uniform pigs were divided into two lots of three pigs each. Lot No. 1 was fed corn and cottonseed meal, one part cottonseed meal to five parts of corn.

Lot No. 2 was fed a pound of molasses for each pound of corn fed to Lot No. 1, and the same quantity of cottonseed meal as fed to Lot. No. 1.

All the pigs were fed in dry lots for sixty days. The results of the experiment are given in the following table:

Table No. 7.

SIXTY DAY TEST.

	Lot No. 1. Corn and Cottonseed Meal	Lot No. 2. Molasses and Cottonseed Meal
Average initial weight	99 lbs.	102 lbs.
Average final weight	205 lbs.	174 lbs.
Average gain in sixty days	106 lbs.	72 lbs.
Average daily gain	1.76 lbs.	1.20 lbs.
Pounds corn consumed per pig	341 lbs.	0 lbs.
Pounds molasses consumed per pig	0 lbs.	341 lbs.
Pounds cottonseed meal consumed per pig	68 lbs.	68 lbs.
Average cost of 100 pounds gain when corn is worth 70 cents per bushel, molasses 15 cents per gallon, and cottonseed meal $25.00 per ton	$ 4.82	$ 7.10
Average value of pigs at beginning of test at 6 cents per pound	5.94	6.12
Value of feed consumed per pig	5.11	5.11
Average total cost of pig, not figuring cost of care	11.05	11.23
Average value of pigs at close of test at 7½ cents per pound	15.32	13.05
Average profit per pig	4.27	1.82

It may be noted from the above table that when corn is worth 70 cents per bushel and molasses 15 cents per gallon, the average cost of 100 pounds of gain, in the case of the pigs getting corn, was $4.82, and in the case of those getting molasses, $7.10. The profit per pig in the lot getting corn was $4.27; in the lot getting molasses, only $1.82.

When supplemented with cottonseed meal, it required 3.22 pounds of corn to make one pound of gain, where it required 4.73 pounds of molasses to make the same amount of gain. One pound of corn then was equal to 1.47 pounds of molasses when fed with cottonseed meal to hogs.

According to the above test, when corn is worth 70 cents per

bushel, molasses, as a feed for hogs, when supplemented with cottonseed meal, is worth 85 cents per 100 pounds, or approximately 10¼ cents per gallon.

EXPERIMENT No. 6.

A Practical Demonstration.

The object of Experiment No. 6 was to demonstrate in a practical and forceful manner the importance of feeding the pig a balanced ration—to illustrate the danger of an exclusive corn ration and to point out the value of a leguminous pasture in the economical production of pork.

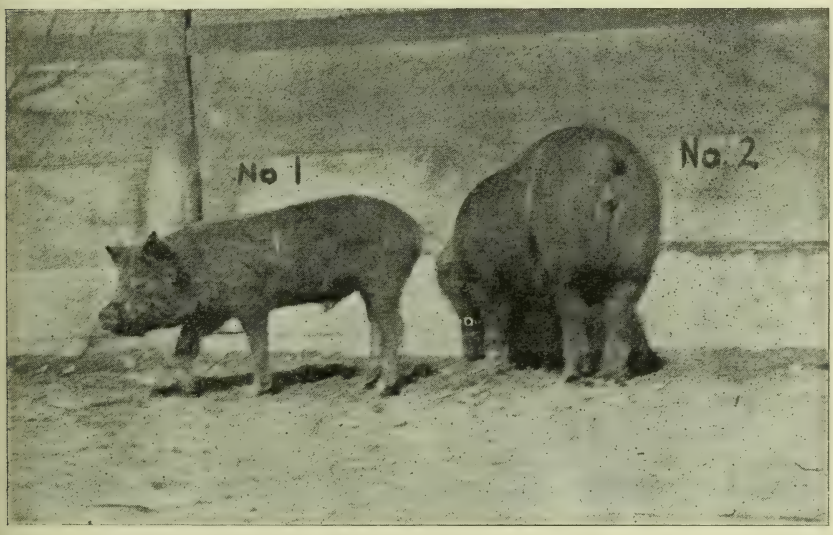


Fig. 6.—Litter Mates.

These pigs are five months old. No. 1 ate all the corn he wanted in dry lot and weighed 77 pounds. No. 2 ate all the corn he wanted on alfalfa pasture and weighs 183 pounds.

Too often our planters feed their hogs an exclusive corn ration. Corn is too low in protein, the muscle and bone building material, to make a complete feed for growing animals; but when properly supplemented with such feeds as tankage, cottonseed meal, wheat shorts, and leguminous pastures—as alfalfa, the clovers, rape, soy beans and peanuts—it is the very best feed. Our planters and breeders should, therefore, realize that feeding of corn alone to hogs is a very wasteful practice, and that the feeds that best supplement it can be grown at home very cheaply.

In this demonstration four pigs were used, two in each lot. They were litter-mates, sixty-five days old and as nearly alike as it was possible to get four pigs. There were two barrows and two sows, a barrow and a sow in each lot. The pigs in Lot No. 1 remained in a dry lot and ate all the corn they wanted; those in Lot No. 2 stayed during the day in a lot where, from a self-feeder, they ate all the corn they wanted, and at night ran on an alfalfa pasture. Both lots had access to clean drinking water, to shade, and to salt. The test, which started on June 1, 1915, ran for ninety days. The following table shows the feed consumed and the gains made during the demonstration:

Table No. 8.

NINETY DAY TEST.

	Lot No. 1. Corn Only	Lot No. 2. Corn and Alfalfa Pasture
Average initial weight	47 lbs.	48 lbs.
Average final weight	77 lbs.	167 lbs.
Average gain in ninety days	30 lbs.	119 lbs.
Average gain per day	.33 lbs.	1.22 lbs.
Average pounds corn consumed	145 lbs.	287 lbs.
Market value of pigs at beginning of test at 6 cents per pound	$ 2.82	$ 2.88
Cost of feed consumed, corn at 70 cents	1.82	3.79
Cost of pasture		1.00
Total cost, not figuring care	4.64	7.67
Market value at end of test, Lot No. 1, 7c; Lot No. 2, 8 cents	5.39	13.36
Profit per pig	.75	5.69

From the foregoing table it will be noted that the profit for each pig getting corn exclusively was only 75 cents; for each pig getting corn supplemented with alfalfa pasture, $5.69, even when $1.00 was charged for the pasture. It may also be noted that the pigs in Lot No. 1 gained an average of only 30 pounds in ninety days; those in Lot No. 2 gained an average of 119 pounds. This difference in gain was due to the feed—the pigs in Lot No. 2 got everything needed to develop their bodies into a finished product; those in Lot No. 1 got only half the material needed for theirs; they had access to all the siding needed, but could get no framing.

SOME SUGGESTIONS WHICH MAY SIMPLIFY SUCCESSFUL BREEDING AND FEEDING.

To make the greatest success with hogs, you must like the business of swine raising and willingly give it both time and thought.

Select the breed you like best, if possible the breed most popular in your section. There is no best breed; all breeds are good when properly cared for.

Use only pure-bred boars of the correct market type.

Select all breeding stock from prolific strains, out of mature sows that have proved themselves good mothers.

By all means provide ample leguminous pastures for every day of the year, and supplement these pastures with corn. This is entirely possible in Mississippi, especially where the following crops grow well: alfalfa, red clover, crimson clover, bur clover, melilotus, rape, peas, peanuts and soy beans.

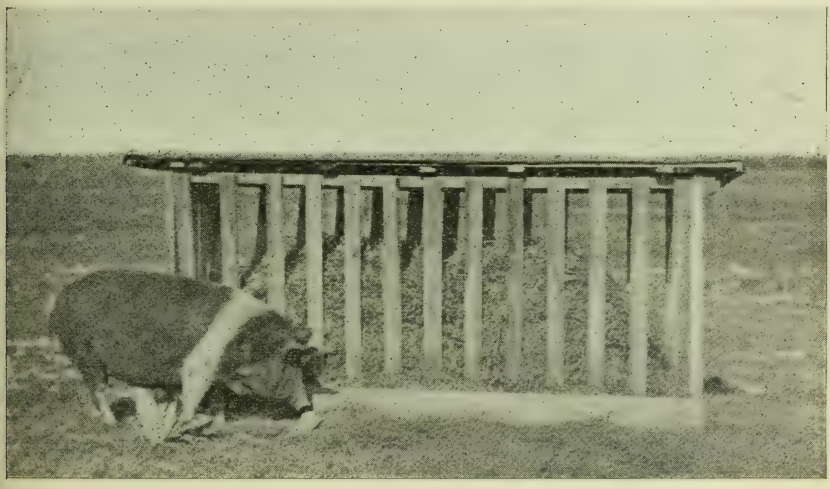


FIG. 7.—HAY RACK FOR HOGS.

When winter pastures are short, feed alfalfa hay from racks.

Provide proper quarters. Hogs require dry and clean quarters. Permanent hog quarters are not desirable. Colony or individual houses are cheapest and best.

Hogs should have only clean, pure water to drink.

Look well to the feeding of the sows. Brood sows, when not suckling pigs, should not be kept too fat. Give them good pastures, but

little grain. When a sow eats her pigs, something is wrong with her feed. In most cases she is fed an exclusive corn diet. If, in addition to corn, a sow has access to a leguminous pasture, or is fed tankage or wheat shorts, she will seldom, if ever, eat her pigs. A good ration for suckling sows is equal parts, by weight, of corn and wheat shorts. Another good ration is seventy parts corn, twenty parts wheat shorts, and ten parts tankage. See that your pigs gain weight rapidly. The most profitable pigs are kept gaining rapidly from birth until marketed. Soaked corn is excellent for suckling sows and young pigs.

Let the hog harvest as much of its feed as possible. The forage field is where the most economical gains are made.

Use the self-feeder where hogs are being finished for market, and where pigs are being fed for rapid gains. It saves time and labor; the pig balances his own ration, and makes more economical gains than when hand-fed.

In hogging off corn—unless there is an ample supply of peas, peanuts or soy beans in the field to balance the corn—provide tankage, cottonseed meal, or wheat shorts in a self-feeder. Likewise, in hogging off peas, peanuts, and soy beans—unless there is enough corn in the field to balance these crops—supply corn in a self-feeder; the best gains will not be made unless corn is supplied, and it is best fed through a self-feeder.

Keep the hogs off the pasture while the ground is wet, when pasturing them on alfalfa or on other pasture where the ground should not be rooted. The hog that is fed a balanced ration will not root except when the ground is wet.

To rid hogs of lice, use crude oil. It may be applied by means of the dipping vat, the rubbing post, or the oiler. The dipping vat is best. Fill the vat with water, and pour in crude oil to the depth of a half-inch. The greatest loss to the hog breeder is often due to worms and lice.

Keep the following mixture for the hogs at all times in a self-feeder. It will aid in preventing worms and will keep the hogs thrifty.

Charcoal, one bushel; Hardwood Ashes, one bushel; Fine Salt, eight pounds; Air-Slaked Lime, four pounds; Sulphur, four pounds; Pulverized Copperas, two pounds.

Mix the lime, salt and sulphur thoroughly; then mix them with the charcoal and ashes. Dissolve the copperas in hot water; sprinkle the solution over the whole mass; then mix thoroughly.

Guard against losses from cholera by keeping the hogs away from running streams, by keeping the quarters sanitary, and by using the simultaneous method of inoculation.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

BULLETIN No. 178

COTTON EXPERIMENTS 1916

Agricultural College, Mississippi
December, 1916

TUCKER PRINTING HOUSE JACKSON MISS

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* In co-operation with U. S. Department of Agriculture.

COTTON EXPERIMENTS, 1916

INTRODUCTION.

This bulletin gives suggestions for cotton culture in different parts of Mississippi, and the results of some of the cotton experiments carried on in 1916 at three of the Mississippi Experiment Stations; namely, the Central or College Station, the Holly Springs Branch Station, and the Delta Branch Station.

The experiments at the Central Station were directed by J. R. Ricks and H. B. Brown; at the Delta Station by G. B. Walker and H. B. Brown; and at the Holly Springs Station by C. T. Ames.

Results from other experiments carried on within the past six years are reported in Bulletins 155, 161, 164, 169, and 173. These bulletins may be had by addressing the Experiment Station, Agricultural College, Mississippi.

The weather for the State as a whole was colder than usual during March and April, 1916, and the rainfall was below normal; but during May the temperature and rainfall both were above the average. June weather was about normal. The marked feature of the July weather was the frequence and heavy character of the rainfall over the eastern and southern portions of the State. Measurable rain fell practically every day and on the average for fifteen days at each weather station, although a few stations had twenty or more days. The average amount for the State was 10.23 inches, more than double the normal July rainfall, and the greatest on record for this month. The rainfall was least and generally below normal in the northwest tier of counties. During August and September, temperature and precipitation were both slightly below normal. This description is based on reports of the Vicksburg, Miss., office, U. S. Weather Bureau.

RESULTS FROM THE CENTRAL STATION, 1916

WEATHER.

The weather at the College Station is amply described in the following table compiled from reports made by Dr. Chas. F. Briscoe, keeper of weather records at the A. and M. College:

TABLE 1.—TEMPERATURE AND RAINFALL, 1916.

MONTH.	Maximum.	Average Maximum.	Minimum.	Average Minimum.	Departure from the normal in temperature	Total inches rainfall.	Departure from the normal in rainfall.	No. days on which rain fell.
January	76	59.8	15	40.4	+ 4.9	4.4		6
February	75	59.1	16	33.6	0.0	2.28	— 2.98	6
March	84	67.9	25	44	— 0.1	2.85	— 3.58	2
April	85	73.6	35	51.2	— 1.2	3.47	— 1.13	4
May	96	84.7	49	61.9	+ 1.7	7.02	+ 2.99	5
June	96	88.1	55	65.8	— 1.6	4.02	— 0.26	9
July	94	88.3				12.63	+ 7.92	16
August	97	90.6	59	69.1	— 0.7	2.58	— 1.42	4
September	96	86.4	40	59.0	— 2.9	.55	— 2.36	2
October	93	80.8	33	52.1	+ 1.7	.82	— 1.29	2
Total rainfall for ten months						40.62		

TABLE 2.—VARIETY TEST AT COLLEGE STATION, 1916

VARIETY STUDIES—The main results of the College Station variety tests are shown in the following table:

VARIETY.	Pounds Seed Cotton per Acre.	Pounds of Seed Cotton per acre on basis of a perfect stand.	Per cent lint	Length of staple in inches	Value of lint per pound in cents.	Lbs of lint per acre	Character of staple	Value of Seed per acre at $60 per ton.	Total money value per acre	Rank in money val.	Weight of 100 bolls in oz.	Germination shown by No. of plants up 12 ds. after planting.	Weight of lint on 500 seeds in grams.
Dodds' Prolific (from Dodds)	501	601	31.6	1 1/16	22	189.9	Fair	$12.33	$54.11	15	21.5	1916	25.2
Dodds' Prolific (from Expt. Sta.)	500	639	29.3	Full 1 1/16	22½	187.2	Fair	13.75	55.87	11	21.0	1436	23.2
Trice-266	538	666	29.9	1 1/16	22	199.1	Fair	14.00	57.78	9	21.5	2360	26.1
Trice (U. S. D. A.)	579	707	28.9	Full 1 1/16	22½	204.3	Fair	15.08	61.05	6	21.2	1340	24.9
Wannamaker-Cleveland	346	490	34.5	7/8	20	169.0	Fair	9.63	43.43	26	23.2	1428	33.5
Cleveland Big Boll	388	490	31.2	1	20½	152.8	Fair	10.11	41.43	27	27.5	762	36.4
Cleveland-027-11-24	429	573	30.2	1	20½	173.0	Fair	12.00	47.47	24	28.2	784	32.4
Cook	534	596	34.4	7/8	20	205.0	Fair	11.73	52.73	16	23.0	2754	34.2
Triumph (from Mebane)	339	510	34.1	1 1/16	22	173.9	Fair	10.08	48.34	21	28.0	672	34.1
Triumph (from Expt. Sta.)	318	475	35.0	1 1/8	23½	166.2	Fair	9.26	48.32	22	27.7	618	33.6
Miller	498	596	30.8	1 1/8	23½	183.5	Poor	12.37	55.49	13	28.5	1050	34.8
Lone Star (U. S. D. A.)	440	495	34.5	1 1/8	23½	160.7	Fair	10.03	47.79	23	28.5	1306	36.0
Lone Star-11	429	547	33.3	Full 1 1/16	22½	182.1	Fair	10.94	51.91	17	30.0	750	36.1
Lone Star-15	592	673	34.9	1 1/16	22	234.8	Fair	13.14	64.80	5	27.5	1432	37.1
Holdon	187	252	30.6	Full 1 1/8	25½	77.1	Fair	5.24	24.80	29	31.0	596	25.0
Polk	569	593	28.5	1 3/16	27½	169.0	Fair	12.72	59.20	7	19.0	2514	22.7
Unknown	445	550	30.5	1 3/16	27½	167.0	Fair	11.49	57.42	10	22.7	1468	26.6
Columbia (U. S. D. A.)	415	476	27.2	1 3/16	27½	119.4	Fair	10.69	43.53	25	25.7	976	28.9
Columbia (from Sherard)	303	365	27.3	1 3/16	27½	99.6	Fair	7.96	35.35	28	23.0	1226	24.6
Big Boll Express (from Allen)	524	582	26.9	1 3/16	27½	156.5	Fair	12.76	55.80	12	20.6	1196	22.7
Express-122	533	617	26.5	1 3/16	27½	163.5	Fair	13.60	58.56	8	18.2	2408	19.7
Express-350	674	758	27.3	1 3/16	27½	206.9	Fair	16.53	73.43	2	20.0	1604	21.9
Express-32	626	725	27.3	Full 1 1/8	25½	197.9	Poor	15.81	66.27	4	20.2	1502	24.5
Express-341	672	747	29.3	Full 1 1/8	25½	218.8	Fair	15.85	71.64	3	18.5	1800	23.1
Lone Star X Express A-38	406	500	30.1	Full 1 1/8	25½	150.5	Fair	10.48	48.86	20	22.5	1296	25.6
Foster-120	672	784	30.3	1 3/16	27½	237.5	Fair	16.39	81.70	1	26.2	1478	28.7
Webber-49	419	528	27.8	Full 1 3/16	29½	146.7	Fair	11.44	54.72	14	22.2	1028	28.9
Sunflower (from Schaefer)	446	488	27.7	Full 1 1/4	30½	135.1	Fair	10.58	51.79	18	19.7	2072	23.3
Sunflower (from Expt. Sta.)	433	503	27.5	1 3/16	27½	138.3	Fair	10.94	48.97	19	20.0	1448	23.2

DESCRIPTION OF VARIETY TEST.

Comparative Yields.—The varieties were grown on valley loam of moderate fertility that had been in cotton for several years. No effort was made to secure phenomenal yields; an ordinary yield under conditions common to a large part of the hill district of the State is of more value than large yields secured under unusual conditions. In variety studies the main interest is in comparative yields.

Culture.—The variety cottons were planted on April 17 in rows 3½ feet apart. When the plants were well up they were thinned to 12 inches in the drill. The weather being favorable, a fair stand was secured, but there was considerable difference in the per cent of germination in different varieties. This is shown by column 12, table 2. The figures given there represent the total number of seedling plants in the plats, counted twelve days after planting. Some of the seedlings died later of a fungus disease, probably anthracnose, but all skips were replanted with hoes on May 5. The first squares were observed on June 5, forty-nine days after planting; open blossoms were noticed on June 27, seventy-one days after planting and twenty-two days after squares first appeared. The maximum rate of flowering was reached on July 18, but there was not much difference in rate from July 15 to July 29. Between the latter date and August 2, the rate fell to almost nothing, and after this only a few scattered blossoms put out. This heavy falling off in blossoming rate was due to increase in boll weevil infestation.

Boll Weevil.—The first weevils found in the plats were discovered on June 12. For several days there was little evidence of weevil work, but by June 21 a good many punctured squares could be found. During the week beginning June 19, punctured squares were picked from all the plants in the plats, and the plants were also shaken in a bag to capture mature weevils. A similar search was made the following week. Fewer weevils were caught the second week; because of wet weather, they multiplied rapidly during the month of July. By the last of the month they were numerous enough to stop the blooming; very few of the bolls put on during the last decade of the month made anything, for as soon as the blossoms became scarce, the weevils attacked the young bolls and ruined many of them. The weevil damage at the Central Station was greater this year than ever before, due largely, doubtless to the wet weather during July. The rainy weather of July fostered reproduction of weevils, caused shedding of squares and bolls and prevented proper cultivation. These detrimental factors taken together made the production of a good cotton crop an impossibility.

Diseases.—A fungus disease injured to some extent the young seedlings of most varieties and caused some boll rot during the wet weather in July. Dry weather during August checked the latter disease and prevented serious loss.

Cotton wilt, or blight, attacked several varieties in the test and did considerable damage during the wet weather. The varieties most diseased were Trice (U. S. D. A.), Trice-266, Cleveland Big Boll, Cleveland-027-11-24, Lone Star, Foster-120, and Sunflower.

Yield.—Column 1 of table 2 gives the actual yield of seed cotton per acre. Column 2 gives the acre yields of seed cotton when computed for a perfect stand of plants. Unoccupied spaces in all rows were measured; and yields were calculated on the basis of all skips being occupied by

plants that produced as well as the others in the row. (In measuring skips in rows only open spaces between the outer ends of branches of successive plants were considered as skips.)The yields given in this column are probably of more value than the yields given in column 1 to use in considering the merits of different varieties. For a fair comparison all stands should be the same.

Lint Per Cent.—Column 3 of the table gives the lint per cent of the different varieties. The figures given in this table are mostly two or three per cent lower than corresponding figures given in former years. This difference is due to the fact that a saw gin was used in ginning the samples this year; while a roller gin that took a larger per cent from the seeds was used formerly. The out-turn given here will correspond closely with the out-turn of the varieties when ginned on a large gin in bale lots.

Classing.—The classing and stapling were done by H. L. Eustis, of Greenville, Miss. The samples ranged in grade from strict to good middling. The prices quoted in the table were current in the Greenville, Miss., market on December 2, 1916, for an average of these two grades.

GOOD VARIETIES FOR EAST AND CENTRAL MISSISSIPPI.

As was shown above, several factors having a bearing on cotton production were very unfavorable during the past season. Under these extreme conditions the medium early big boll varieties like Cleveland and Miller did not yield so well as some of the extra early small bolled varieties, like Trice and Express. It is not safe, however, to judge the merits of a variety from one year's testing. The medium early big boll varieties like Wannamaker-Cleveland, Cleveland Big Boll, and Miller have made a good showing in a number of tests each year for several years; consequently we are inclined to think that they are excellent varieties for the hill portion of the State. These varieties are vigorous growers, are fairly resistant to disease, and have a good percentage of lint and a staple of good length for a short cotton. Express has in the past three years made a good showing on valley land; and we are inclined to think no other cotton will do better on valley land under heavy boll weevil infestation. Trice ranks next in value to Express, for the conditions just mentioned. On very rich land that is free from wilt, Trice will probably yield better than Express, Wannamaker-Cleveland, Cleveland Big Boll, or Miller.

Express-350 and some others of our new strains of Express give promise of being considerably better than the parent strain. Express-122 is the only one of the new Express strains that is ready for distribution. Foster-120 is another of our new strains that has made a good showing in several tests. This strain has a slightly longer staple than Express, a larger boll, a better lint percentage, and is a better rich-land cotton. It is, however, not quite so early nor so prolific as Express; it is also rather susceptible to the wilt disease and the staple is somewhat irregular.

CULTURAL METHODS FOR EAST AND CENTRAL MISSISSIPPI.

Preparation of the Seed Bed.—The character of the soil very largely determines the time of breaking. A stiff soil should be plowed in the fall or winter and left rough for the action of the freezes. A light soil should be plowed only a short time before planting, especially if the tendency is to wash badly. On level lands the plowing can be done in

fall or winter, the earlier the better, that the vegetable matter may be more nearly decomposed by spring.

The method of plowing is determined in large part by time and team power. Flat breaking or broad-casting, the land to a depth of eight to ten inches and then ridging it with a middle buster in the spring gives the best seed bed. Planting on a small ridge or bed is better for cotton than planting flat, since the land dries out and warms up earlier, the seed germinate better, and the first cultivation can be made without damaging the young plants. Throwing two furrows together with a turning plow and using a middle buster to split the balks is a common practice, which is all right if done early and the ridges freshened at planting time with a harrow. A method which is followed to some extent is to split the old beds or ridges with a four-mule middle buster. This covers all vegetable matter, which decays by spring. Just before planting, these ridges are freshened with a turning plow and then smoothed with a disc harrow followed by a smoothing harrow.

Planting.—The planting should be done just as early in the spring as weather conditions will permit, after the soil has become warm enough to germinate the seed readily. At the Central Station the best time for planting is usually from the 15th to the 20th of April. South of the Station the planting can be done earlier, and north a few days later. The date of planting is also determined somewhat by the character of the soil. A well drained loam soil can be planted earlier than the stiffer soils. In our experiment plats we have planted earlier than the foregoing dates; but we have failed in getting a stand just about as many times as we have succeeded. The cold may not be severe enough to kill the young plants, but it will retard their growth to such an extent that they will not yield so well as later plantings.

Under boll weevil conditions, if a stand is not secured early in the spring, a second planting of cotton should not be made. Some other crop should be put in. To secure a stand "plenty" of seed should be planted. We prefer to use a bushel or more to the acre and then to chop to the proper stand. With a good seed bed and the surety of proper moisture and temperature, a half bushel per acre would be sufficient for a perfect stand; but, these conditions are so uncertain, and the risk so great that not less than a bushel per acre is necessary. The seed should be planted shallow.

Cultivation.—The first cultivation will necessarily have to be shallow to prevent covering the young plants. A side harrow or a Gee Whiz cultivator is a good implement for this purpose. The succeeding cultivations should be as deep as possible without injury to the plants. When, however, the plants are 8 to 10 inches high, the cultivations should be shallow, but deep enough to make a good mulch. In case of continued rain, which will prevent regular cultivation, it will be necessary to destroy grass and weeds. The implement that you have that will do this best is the one to use. It is a bad practice to turn the soil away from the young plants. If the destruction of grass and weeds make this operation necessary, the soil should immediately be returned to the roots of the young plants.

Cultivations should be continued as long as can be without injury to the plants. In our experiment plats we cultivate till the first week in August.

Spacing of Cotton.—For the past eight years the Central Station has conducted tests in spacing cotton. The tables below give the results for 1916. These results are much like the results of preceding years. Though the yields have always been greater than this year, the plats maintain their relative positions in production.

TABLE 3.—WIDTH OF ROWS.

3 foot rows	620 pounds of seed cotton per acre.
3½ foot rows	540 pounds of seed cotton per acre.
4 foot rows	490 pounds of seed cotton per acre.
4½ foot rows	480 pounds of seed cotton per acre.
5 foot rows	400 pounds of seed cotton per acre.

The plants in the above plat thinned to twelve inches in the drill, grew approximately four feet high.

TABLE 4.—DISTANCES IN THE DRILL.

12 Inches	576 pounds of seed cotton per acre
24 Inches	480 pounds of seed cotton per acre
36 Inches	450 pounds of seed cotton per acre

SINGLE STALK COTTON CULTURE.

What It Is.—In several recent publications of the Bureau of Plant Industry*, United States Department of Agriculture, a method of cotton culture designated as "Single Stalk Cotton Culture" has been advocated. The essential feature of the system is the suppression of vegetative branches by delayed thinning. If plants are allowed to crowd each other in the drill for a time, the development of vegetative branches is prevented to some extent. It is claimed that the suppression of vegetative branches stimulates the fruit branches and an earlier crop is produced; if the vegetative branches are lacking, more plants can grow in a row without crowding each other injuriously and greater yields will be produced.

Unfavorable Conditions.—During the season of 1916 a test of the "Single Stalk" system under Mississippi conditions was made at the College Station. The test was by no means conclusive. The season was very unfavorable for cotton growing and the stand was not all that could be desired for an experiment of this kind. The results, which may be of some interest, are presented for what they are worth.

The cotton used in this experiment was planted on April 17 on moderately fertile valley land. The land was divided into five sections embracing 110 rows. The first section was divided into six plats, each plat containing three rows five feet apart—eighteen rows. The second section likewise divided into six plats, contained nineteen rows 4½ feet apart. The third, also divided into six plats, embraced twenty-one rows four feet apart. Each of the other sections, in which "never thinned" cotton grew, was divided into seven plats; the fourth containing twenty-four rows 3½ feet apart; and the fifth, twenty-eight rows three feet apart. Thus each plat contained three or four rows.

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* "A New System of Cotton Culture," a paper in Circular 115.
"A New System of Cotton Culture and its Application," Farmers' Bulletin 601.
"Single Stalk Cotton Culture," Document 1130.
"Single-Stalk Cotton Culture at San Antonio," Bulletin No. 279.

TABLE 5.—SINGLE STALK COTTON CULTURE RESULTS.

	ROWS.	Number of Plants.	Number of Vegetative Branches.	Number of Vegetative Branches per plant.	Pounds of seed cotton.
	3-foot rows				
1	Never thinned	119	58	.48	1.95
2	Wide spaced	37	69	1.89	1.50
3	Wide spaced	40	54	1.35	1.00
4	Single stalk	80	72	.90	1.62
5	Single stalk	84	76	.90	1.67
6	Wide spaced	48	77	1.60	2.00
7	Wide spaced	53	96	1.81	1.86
8	Single stalk	96	83	.86	2.28
9	Single stalk	106	86	.81	2.10
10	Wide spaced	50	83	1.66	1.27
11	Wide spaced	66	84	1.27	1.55
12	Single stalk	57	72	1.26	1.82
13	Single stalk	127	86	.67	2.63
	3½ - foot rows				
14	Never thinned	168	51	.30	1.65
15	Never thinned	189	73	.39	2.10
16	Wide spaced	48	74	1.54	1.83
17	Single stalk	93	85	.91	2.51
18	Wide spaced	66	82	1.23	2.35
19	Single stalk	83	84	1.01	1.94
20	Wide spaced	52	65	1.25	1.28
21	Wide spaced	55	104	1.89	2.58
22	Single stalk	97	69	.71	2.85
23	Single stalk	86	80	.93	2.00
	4-foot rows				
24	Wide spaced	64	68	1.06	2.08
25	Wide spaced	52	77	1.48	1.87
26	Single stalk	93	104	1.12	2.20
27	Wide spaced	54	90	1.66	1.92
28	Single stalk	92	109	1.18	2.60
29	Wide spaced	50	109	2.18	2.35
30	Wide spaced	66	133	2.01	2.39
31	Single stalk	79	114	1.44	2.35
32	Single stalk	94	111	1.18	2.50
	4½ - foot rows				
33	Wide spaced	53	101	1.90	
34	Single stalk	78	123	1.57	
35	Wide spaced	61	95	1.55	
36	Single stalk	101	135	1.33	
37	Wide spaced	62	107	1.72	
38	Single stalk	90	119	1.32	
39	Single stalk	104	95	.91	
	5-foot rows				
40	Single stalk	131	88	.67	
41	Wide spaced	64	145	2.26	
42	Single stalk	126	102	.81	
43	Wide spaced	50	123	2.46	
44	Single stalk	110	104	.94	
45	Wide spaced	63	103	1.63	

The plants in alternate plats were thinned to eight to twelve inches in the drill on May 20. The plants in the remaining plats grew undisturbed until June 7, when all except those designated in table as "never thinned" were thinned to six inches in the drill. The "never thinned" plants, grown in only two plats, remained, as their name implies, unthinned to the last.

In table 5, only middle rows are compared; this is to say only the second rows of three row plats or the second and third rows of four row plats.

Results.—The main results of the Single Stalk culture experiment are shown in tables 5, 6, and 7.

TABLE 6.—AVERAGES FROM SINGLE STALK COTTON CULTURE EXPERIMENT.

ROWS.	Average number of plants per row.	Average number of vegetative branches per row.	Average number of vegetative branches per plant.	Average number of flowers per row.	Average number of lbs. of seed cotton per row.
Wide spaced rows....	54.9	92.3	1.68	539	1.86
Single stalk rows.....	95.6	95.1	.99	647	2.22
Never thinned rows	158.6	60.6	.32	559	1.90

Superiority of Single Stalk Rows.—Tables 5 and 6 indicate that single stalk rows are best. Though the average yield is in no case great, the yield of the single stalk rows is better than that of the wide spaced or the never thinned rows, and this is true in respect to every width of row—three, three and a half, and four feet. For individual rows, likewise, the yield of the single stalk rows excels that of either the wide spaced or the never thinned. The single spaced rows, it should be noted, contain nearly twice as many plants as the wide spaced rows. Though they have about the same number of vegetative branches, they average per plant considerably less— .99 against 1.68. Per row the single stalk rows produce twenty per cent more blossoms than the wide spaced rows and about sixteen per cent more than the never thinned rows.

The average never thinned row contains far more plants than either the single spaced row or the wide spaced; 158.6 to 95.6 or 54.9. The plants, however, are so close together that apparently they injure one another. The never thinned row also has fewer vegetative branches than either of the others. This comparative absence of leaf branches however did not influence the yield greatly.

Superiority of the Three Foot Row.—The three foot row made the best yield per acre. The three and a half foot row made the next best. The four foot row made the lowest. The weights of the four and a half and the five foot rows are not used in this comparison because of an error made in picking the cotton.

Table 7 gives the flowering record of each row throughout the flowering season. Practically all the blossoming was done in July. The blossoms that opened in the last week of July produced very little fruit—boll weevils destroyed the young bolls.

ROWS.	June 29	30	July 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Aug. 1	Total.
3 Foot Rows—																																			
1 Never thinned	0	0	1	4	4	8	6	17	16	12	17	11	18	25	10	18	27	33	38	50	27	34	25	24	35	23	30	19	20	11	8	4	3	0	578
2 Wide spaced	1	0	2	2	4	5	9	9	12	9	11	5	16	12	12	6	18	17	35	25	22	19	16	14	26	15	18	24	9	10	6	2	3	3	397
3 Wide spaced	3	0	1	1	5	6	2	1	13	5	8	6	8	7	8	10	16	8	31	30	11	26	6	21	23	16	20	25	13	14	5	2	3	2	356
4 Single stalk	0	1	7	1	7	9	8	11	12	9	14	10	15	14	22	18	17	29	37	40	17	22	22	24	31	33	20	21	19	5	5	2	2	2	506
5 Single stalk	1	3	2	3	7	5	10	9	14	7	13	9	26	15	20	13	33	24	42	28	25	27	40	17	43	38	36	20	28	13	7	4	3	3	588
6 Wide spaced	2	1	2	3	6	13	9	14	13	6	11	10	18	16	9	15	20	23	30	38	33	35	24	33	34	6	23	22	23	11	6	5	0	1	517
7 Wide spaced	1	0	5	4	6	9	7	8	12	8	12	7	15	12	11	20	24	20	37	40	56	30	28	29	27	30	25	25	22	10	8	3	2	2	555
8 Single stalk	0	1	1	3	8	20	15	13	17	13	16	13	28	26	11	25	37	33	50	47	36	35	24	30	29	22	23	15	11	11	2	2	1	5	623
9 Single stalk	2	2	3	5	7	17	8	17	12	10	15	11	19	23	22	20	42	21	57	54	31	35	23	20	42	31	26	12	13	8	6	6	1	7	628
10 Wide spaced	1	2	0	3	5	7	6	5	10	7	9	11	11	15	11	17	17	25	38	32	19	29	14	17	34	22	17	14	8	5	6	7	3	2	429
11 Wide spaced	3	1	4	3	6	7	6	8	16	9	13	13	19	15	13	14	36	27	51	46	29	32	28	31	55	28	30	15	13	11	5	2	3	3	595
12 Single stalk	2	1	0	2	7	4	4	13	19	11	17	15	23	15	15	22	25	26	37	38	40	32	27	23	28	10	18	16	7	8	4	5	2	3	519
13 Single stalk	0	3	7	8	4	11	13	25	28	14	21	9	23	24	14	27	51	32	69	65	35	52	38	32	39	32	35	12	22	5	4	4	3	5	766
3½ Foot Rows—																																			
14 Never thinned	0	1	2	4	4	8	8	12	15	4	12	10	13	23	12	16	29	34	40	33	27	43	13	18	27	21	19	14	9	10	9	1	5	5	501
15 Never thinned	1	4	6	1	3	10	14	22	19	8	13	17	22	26	16	20	41	39	65	39	19	40	13	19	33	15	25	15	11	12	6	2	3	2	600
16 Wide spaced	1	3	2	2	5	11	6	14	9	6	12	19	15	11	9	21	22	24	35	25	22	19	46	16	29	25	26	23	23	12	4	4	5	3	509
17 Single stalk	2	1	2	3	20	16	13	21	23	14	18	8	25	23	20	23	30	26	55	42	26	28	27	39	34	20	33	17	21	24	10	9	0	4	677
18 Wide spaced	1	1	1	3	4	12	8	10	16	8	15	10	24	18	12	23	33	22	43	53	34	31	18	31	20	22	19	10	9	13	10	5	7	2	548
19 Single stalk	1	1	0	2	8	12	7	22	19	9	15	10	27	19	15	26	42	23	44	36	28	25	21	22	21	17	24	9	16	10	8	5	1	4	549
20 Wide spaced	0	0	2	3	8	11	9	16	21	8	15	8	22	12	15	30	27	17	41	38	26	24	17	15	26	18	34	20	18	11	3	5	3	6	529
21 Wide spaced	2	2	4	2	8	6	13	8	13	9	13	11	21	22	15	16	25	38	26	51	27	31	17	29	36	24	32	22	23	10	14	4	8	6	588
22 Single stalk	0	1	3	2	7	9	3	15	23	15	15	8	25	24	13	26	37	30	40	37	30	27	20	30	20	22	20	14	5	10	7	4	4	2	548
23 Single stalk	1	2	0	3	6	11	13	12	10	4	17	12	16	19	12	20	40	12	53	35	38	37	27	29	26	19	25	14	18	12	4	1	3	3	554
4 Foot Rows—																																			
24 Wide spaced	1	2	0	1	9	11	8	14	9	7	17	5	20	13	12	31	26	18	42	34	21	37	26	26	27	22	23	10	10	10	5	2	3	4	506
25 Wide spaced	3	0	1	1	3	6	6	9	11	9	8	14	15	21	9	17	25	13	41	36	25	19	13	23	27	22	26	15	16	11	2	6	3	3	469
26 Single stalk	1	0	0	5	0	8	5	16	16	7	20	7	22	18	14	21	41	30	45	42	33	34	29	32	51	30	37	13	14	9	3	5	0	1	603
27 Wide spaced	1	1	6	0	8	6	7	7	9	7	8	7	19	9	11	17	21	19	36	40	24	23	23	29	31	22	28	17	17	15	5	8	6	4	491
28 Single stalk	2	3	3	10	4	19	12	16	16	13	14	13	19	13	15	26	29	25	57	62	41	33	34	40	29	39	41	11	7	11	5	10	2	1	675
29 Wide spaced	0	3	3	3	10	12	9	12	15	8	11	13	15	19	12	26	26	27	53	52	27	40	30	46	34	35	38	15	21	10	4	1	1	4	635
30 Wide spaced	3	2	2	7	3	13	5	11	17	8	15	10	20	19	16	22	31	32	36	43	31	31	24	38	36	37	27	25	23	20	4	4	1	3	619
31 Single stalk	3	2	10	1	7	13	6	14	11	15	19	7	20	19	13	24	36	31	46	51	28	34	27	44	39	31	41	29	13	12	14	4	1	1	666
32 Single stalk	5	3	4	4	12	13	19	25	32	15	20	14	21	33	16	22	41	36	54	48	44	46	35	23	27	18	40	32	19	6	4	3	1	0	745
4½ Foot Rows—																																			
33 Wide spaced	2	3	6	3	8	13	6	12	15	6	18	11	29	23	10	23	37	25	47	47	34	46	27	44	24	44	30	23	16	10	8	2	2	5	659
34 Single stalk	3	5	7	0	7	8	18	14	17	9	20	19	20	20	24	22	38	33	46	52	34	22	28	31	42	40	31	14	15	8	10	2	2	1	662
35 Wide spaced	3	1	1	2	7	7	4	9	13	4	12	12	14	12	5	23	32	19	45	39	29	23	21	25	20	23	33	21	21	9	4	2	5	4	504
36 Single stalk	1	4	3	6	12	18	10	18	22	16	18	16	22	25	10	29	38	37	48	48	29	47	12	36	36	31	35	20	22	11	7	1	0	1	689
37 Wide spaced	5	1	2	4	6	16	12	16	14	10	16	13	13	18	15	18	32	17	27	35	23	30	35	22	35	34	33	27	22	14	5	3	0	2	575
38 Single stalk	2	3	3	4	6	10	8	12	18	5	14	9	25	32	7	28	58	32	53	70	27	46	16	38	40	28	33	24	5	13	10	1	0	2	684
39 Single stalk	1	1	4	0	11	12	13	16	20	5	17	11	21	14	14	36	36	38	42	56	34	26	34	41	46	34	31	25	15	14	5	2	2	1	678
5 Foot Rows—																																			
40 Wide spaced	3	4	2	3	7	11	6	13	15	11	12	9	16	10	13	21	27	34	35	49	27	31	25	27	26	28	16	10	8	6	6	2	1	2	516
41 Single stalk	2	1	4	6	13	13	17	22	22	10	21	21	23	29	21	41	45	32	60	42	53	41	28	24	53	25	42	23	8	15	9	2	1	2	771
42 Wide spaced	0	2	1	4	7	9	15	17	22	20	12	11	23	20	9	30	42	31	39	42	27	37	34	40	37	35	48	22	19	13	12	8	0	4	692
43 Single stalk	0	2	3	7	6	22	11	15	18	16	14	12	25	20	19	28	46	31	50	57	28	53	25	48	41	36	38	21	25	12	5	0	3	0	737
44 Wide spaced	2	3	3	2	14	9	11	15	11	11	14	9	10	21	13	24	40	22	42	35	35	31	22	42	50	36	28	17	26	25	9	4	1	3	640
45 Single stalk	2	3	3	6	6	8	12	20	24	21	22	20	28	14	17	32	49	28	33	58	25	35	31	43	54	39	31	27	23	9	5	0	0	0	728

SUMMARY.

The results of this experiment with the single stalk system agree in general with the results obtained by Cook, Meade, and others of the Bureau of Plant Industry. Meade in his experiments at San Antonio, Texas, secured a considerably higher margin of yield in favor of the single stalk system than was secured in the College test. His results, however, are open to criticism. His wide spaced and single stalk plantings were alternated, in rows or in blocks and the cotton was saved from all the rows. A thick row growing by the side of a thin row is sure to make a greater yield. It has the advantage in that there are more plants, and these plants are not crowded very seriously.

In the College experiment we have not proved, necessarily, that the increased yields were due rather to the delayed thinning than to leaving the plants close together in the drill when thinning, nor do we see that the Bureau of Plant Industry investigators have proved this point. Ricks, of the Mississippi Experiment Station, has shown by a series of experiments extending over a period of eight years, that under conditions prevailing on the College Station farm, close spacing will give higher yields than wide spacing. A further discussion of the subject is given on page 34 of this bulletin.

COTTON WILT EXPERIMENTS.

The experiment work with cotton wilt during the current year was similar to the experiments of the past three years. Prominent wilt resistant varieties were grown on wilt infected soil along with susceptible varieties, and a number of wilt resistant plants selected from an infected plat were tried out in progeny rows.

The plants in this test started out well early in the season and grew well until the heavy July rains came. The rainy weather prevented cultivation, caused a shedding of forms, fostered the reproduction and increase of boll weevils, and favored the spread of the wilt disease. Dry weather began in August and continued the rest of the season. This served to hold the disease in check, otherwise a large part of the plants would have died.

TABLE 8.—COTTON WILT EXPERIMENT, 1916.

VARIETY.	No. plants in plat	Number Plants infected with Wilt.	Per cent. of healthy plants.	Pounds of Seed Cotton per acre.	Pounds of Seed Cotton per plant.	Per cent lint	Length of lint	Value of lint per pound	Total money value per acre
Dixie	471	180	61.8	305	.021	31	1	20½	$25.68
Trice	424	291	31.4	313	.024	29.9	1	20½	25.74
Covington Toole	447	170	61.9	329	.024	33.5	1	20½	29.15
Lone Star (U. S. D. A.)	348	249	25.6	274	.022	34.4	1 1/8	23½	27.22
Wannamaker-Cleveland	282	172	39.0	289	.033	35	7/8	20	25.85

As a consequence of the contrary factors, the yields were extremely low, as shown by table 8. Covington-Toole, as in former years, led in yield and money value per acre. Wannamaker-Cleveland led in yield per plant by fifty per cent and would have led in yield per acre had the original stand been satisfactory.

As is shown in column 2 of table 8, a large per cent of the plants of all the varieties were wilt infected at the close of the season. The infection probably harmed the Dixie and Covington-Toole plants very little, for none gave any external signs of being infected. About five per cent of the Wannamaker-Cleveland died from the effects of the disease and ten per cent were weakened by it; the other forty-six per cent (infected plants) gave no external symptoms of the disease and were not injured seriously. About ten per cent of the Trice plants died and twenty-five per cent were injured; the other thirty-three per cent (infected plants) were not harmed greatly. Out of a total of three hundred and forty-eight of Lone Star plants, two hundred and forty-nine were infected. This variety was injured more than Wannamaker-Cleveland but not as badly as Trice.

Under heavy weevil infestation it is hardly advisable to attempt to grow cotton on land badly infected with wilt, even the best wilt resistant variety known. However, Wannamaker-Cleveland in spite of heavy boll weevil infestation has yielded fairly well, on the College farm on land that is to some extent wilt infected. This is the best variety we have tried for such conditions. Dixie and Covington-Toole are wilt resistant, but they are too late to combat the weevil satisfactorily.

Several wilt resistant varieties that have been tested in Alabama are described in a recent publication of the Alabama Experiment Station. Of the varieties "Tri-Cook," a hybrid between Triumph and Cook, is the most promising, but it has not yet been tried under heavy boll weevil infestation.

CONTROL OF COTTON WILT.

For the State of Mississippi as a whole cotton wilt, or "black root," is not a serious disease, yet there are large areas in the cotton growing district in which it does do much harm. In certain limited areas in Mississippi considerable loss is occasioned by this disease.

The disease is caused by a fungus organism (*Fusarium vasinfectum Atk.*), that lives in the soil and enters the cotton plants through their roots. The action of the organism and the symptoms by means of which diseased plants can be recognized are described in some detail in Mississippi Agricultural Experiment Station Bulletin No. 173. This fungus thrives apparently only in sandy or sandy loam soils. It causes more trouble during rainy than dry seasons. It is carried from infected to uninfected soils in various ways—by flowing water, plows, the feet of mules, etc.

A number of control measures have been tried, but none have proved very satisfactory. The disease cannot be eradicated by the use of fertilizers; and chemical fungicides used in the soil have not reduced the disease. Rotation of crops helps some, because this fungus attacks no plants except cotton; yet it will live in the soil for years, even when no cotton is grown. It seems to be impossible to get entirely rid of it even by using long periods of rotation.

The most promising method of control is by breeding better resistant varieties. Certain varieties have been developed already that are fairly satisfactory in a struggle against wilt alone. It is within the range of possibility to develop a strain that will be wilt resistant and early enough to yield well under weevil conditions. Some of the wilt resistant plants selected by the Mississippi Experiment Station last year

and grown in progeny rows this year, made fifty per cent more cotton than the parent strain, both growing under the same conditions. It must not be inferred that it is an easy matter to develop wilt resistant strains of cotton. It is, in fact, a very difficult matter and requires years of careful work. But we are inclined to think that any planter who will use proper care with persistence, can develop a cotton highly resistant to wilt.

A number of apparently resistant individual plants growing on wilt infected soil should be selected. Seed from these plants should be planted in progeny rows,—plant to row method. Seed from the most resistant and most prolific of these rows may be planted in a further test the following year. Seed from the best rows, as shown by the second year's testing, should be planted in a multiplying patch. From this patch new individual plant selections may be made and so on. All of this testing must be done on wilt infected soil. If such a plan is followed for a number of years, strains more resistant to wilt and better adapted to local conditions are likely to develop.

NATURAL CROSSING IN COTTON.

To all persons interested in cotton breeding and in maintaining the purity of a variety or strain, the subject of natural crossing, or hybridizing, is one of considerable importance. Various opinions are held as to the amount of crossing that takes place when two varieties are planted in close proximity. The results obtained by different investigators vary considerably, due largely, doubtless, to varying conditions in respect to the number and kinds of insects in the locality where the studies were made.

Most recent writers have expressed the opinion that the crossing of plants growing near one another takes place very commonly. Balls* says, "The vast majority of individuals in any cotton crop yet studied are heterozygous in several characters, and the amount of crossing which takes place between cotton plants growing in a field so producing this heterozygous condition, ranges from five to twenty-five per cent, by experimental evidence." Cook† also is of the opinion that cross fertilization takes place very frequently. He says, "The experiments with Egyptian cotton in Arizona confirm the results of our Texas experiments in showing that cross fertilization takes place in a much larger proportion of cases than previous writers on the subject have supposed. The large, showy, open flowers of the cotton plant invite the visits of insects, so that a large amount of cross fertilization has to be expected whenever different varieties or types of cotton are grown in the same vicinity close enough for the same bees to visit the flowers of more than one kind."

Allard‡, in an experiment carried on in northern Georgia, noted a crossing of twenty per cent between different varieties when planted in alternate rows.

**Some Cytological Aspects of Cotton Breeding*, by Lawrence Balls, M. A. *Proceedings of American Breeders' Association*, Vol. V, p. 27.

†*A Study of Diversity in Egyptian Cotton* by O. F. Cook and others. Bul. No. 156, Bureau of Plant Industry, U. S. D. A., July 1909.

‡*Preliminary Observations Concerning Natural Crossing in Cotton*, by H. A. Allard

Vol. VI, American Breeders' Association Report, p. 160.

In the experiments carried on by the Mississippi Experiment rather low percentages of crossing have resulted, but these differed considerably with varieties. In these experiments different green leaf varieties were planted in rows alternating with rows of Willet's Red Leaf cotton. Each green leaf row grew with a red leaf row on each side. 100 bolls were picked from each of the green leaf rows, and the following spring the seed from these bolls were planted in separate plats. In the case of two of the varieties stakes were driven down in the rows so as to keep the plants from one boll separate from the progenies of other bolls. The Red Leaf plants have a deep red color, and when crossed with green leaf varieties produce hybrid plants that show the red color very distinctly, thus making them easily recognizable. By counting the plants of each kind appearing in the plats planted from the hundred bolls, it is an easy matter to determine the per cent of crossing that took place the year before.

The plants grown in 1915 were partly thinned by mistake before counts had been made so the results for that year are not altogether reliable. The "choppers" may have favored one or the other of the two kinds of plants. The results obtained were as follows: Lone Star-132 showed a crossing of 2.8 per cent; Triumph, 4.9 per cent; Cleveland, 13.9 per cent; Trice, 1.6 per cent; Lone Star-15, 10.2 per cent.

In the tests of 1916 all the plants produced were counted. The numbers ran as follows: Cleveland, pure 251, hybrids 13—per cent of crossing 4.9; Lone Star-132, pure 464, hybrids 25—per cent of crossing 5.1; Triumph, pure 224, hybrids 25—per cent of crossing 11.1; Lone Star-15, pure 1194, hybrids 94—per cent of crossing 7.3; Trice, pure 907, hybrids 64—per cent of crossing 6.6; Cleveland, from bolls picked from hills alternating with Red Leaf hills, pure 75, hybrid 17—per cent of crossing 18.5; Cleveland, from bolls picked from the middle of a four row plat that was separated from Red Leaf cotton by ten rows of corn, pure 244 plants, hybrids 2—per cent of crossing .8.

Table 9 shows the number of pure and hybrid plants in individual boll progenies of Trice and Lone Star-15. The first number in column 1 is the number of pure plants coming from a certain boll, and the first number in column 2 is the number of hybrid plants coming from the same boll. It will be noticed that a large number of the bolls produced no hybrid plants and the ones that did produce some hybrid plants produced only a relatively small number per boll. This shows that even where there is cross pollination of a flower, only a small portion of the ovules are affected.—(See table 9 on page 17.)

BOLL WEEVIL.

The boll weevil is at present the chief limiting factor in the production of cotton in Mississippi. Since 1907 it has spread throughout the State and gradually increased in numbers. In 1916 the damage done was greater than ever before, but this was due in part to the rainy weather during July which favored weevil reproduction. Some counties in the northern part of the Delta have not had much damage as yet, and other places have experienced considerable fluctuation in amount of damage; but on the whole there has been a gradual increase. There is at present no good evidence that the worst has been reached.

BOLL WEEVIL CONTROL.

Various methods of weevil control have been suggested and tried, but no thoroughly satisfactory method has been found. Picking weevils by hand during the early part of the season, or capturing them by the hoop and bag method (shaking plant in a bag which has a barrel hoop sewed in it to keep it open), and picking up infested squares have all proved to be of little practical value. Coad, entomologist in charge of Government boll weevil investigations at Tallulah, La., in experiments carried on a year or two ago, secured an apparent increase of about twenty per cent in cotton yield by gathering weevils regularly and systematically, but later experiments failed to verify these results. On the College farm during the past season weevils and punctured squares were collected from certain plats each week for a period of six weeks following June 21. The bag and hoop method was used and in addition punctured squares were collected by hand both from plants and from the ground. The plants were not large and more thorough work was done than ordinary plantation labor would do. This collecting had a tendency to lessen infestation, but enough weevils appeared each week to destroy a large portion of the forms put on. This cotton was planted near a woods which was probably a good hibernating place for the weevils and served as a source of infestation in the spring. Other plats farther away from the woods, from which weevils were collected only twice, made more cotton.

There are a number of weevil catching machines on the market, but we have never yet seen one that is as effective and satisfactory as a hoop and bag.

It may pay to collect weevils early in the season before the cotton begins to square, if labor is cheap and plentiful, but even that is doubted by some.

Hinds, in Bulletin No. 188, issued by the Alabama Experiment Station, makes a number of suggestions for cotton farming under boll weevil conditions. Below is a summary of a part of the recommendations made:

1. Hold farm labor.
2. Raise a variety of crops and rotate.
3. Grow more feed, forage crops, and live stock.
4. Provide markets for new products.
5. Improve soil by keeping live stock, and by growing legumes and green manure crops.
6. Reduce cotton acreage so as to give cotton best of care.
7. Prepare soil better before planting.
8. Grow a good variety and one suited to the soil.
9. Plant as early as conditions will permit.
10. Plant on a uniform date.
11. Give frequent and shallow cultivation.
12. Collect weevils before squaring begins.
13. Destroy cotton stalks as early as possible.
14. Clean ditches, turn rows, and fence lines.

There is evidence indicating that forests and large timber afford excellent hibernating places for boll weevils. Cuts of cotton near a forest are usually infected before cuts farther removed, and weevils are more numerous there during the season. Clearing timber tracts

on plantations devoted largely to cotton farming is to be recommended. Where this is not practicable, cotton should be planted as far from the woods as is possible.

If it were possible to get all growers to destroy their cotton stalks a week or two before frost, the boll weevil problem would probably be largely solved; for under such procedure most weevils would starve before going into hibernation. This year the College Experiment Station cut all the cotton stalks on the farm early in October. Part were cured and stacked for hay, while the rest were cut up and put into a silo. The stalks contain considerable nutriment and give promise of value as feed. Cattle eat about forty per cent of the cured plant with apparent relish.

TABLE 9.—NUMBER OF PURE AND HYBRID PLANTS IN INDIVIDUAL BOLL PROGENIES, NATURAL CROSSING EXPERIMENT.

Trice	Hybrid	Trice	Hybrid	Trice	Hybrid	Trice	Hybrid	Lone Star-15	Hybrid	Lone Star-15	Hybrid	Lone Star-15	Hybrid	Lone Star-15	Hybrid
10	0	16	0	10	2	6	0	4	0	6	0	10	2	3	0
4	0	24	0	2	1	8	0	3	0	10	0	11	0	12	1
1	0	21	0	6	0	14	1	22	1	12	0	13	0	16	0
7	0	17	1	14	0	14	4	19	0	3	0	13	1	2	0
12	1	8	0	12	1	18	0	10	0	4	1	8	0	13	0
10	0	15	1	18	0	1	0	7	1	16	0	4	0	13	4
15	5	15	2	18	0	13	1	9	3	8	1	16	1	9	0
12	0	17	0	13	0	19	0	15	2	8	0	8	0	9	0
6	0	16	0	5	0	18	1	2	3	8	0	15	0	12	1
3	0	12	2	19	1	11	0	2	0	2	0	7	0	6	0
3	1	13	1	15	0	10	1	19	0	5	1	12	1	15	0
12	1	18	0	17	2	11	0	11	2	19	3	14	0	8	0
14	0	8	1	12	1	4	2	17	3	3	0	2	2	6	0
24	0	11	1	20	0	13	0	8	0	13	4	8	0	15	2
14	2	15	2	14	0	16	3	9	4	2	0	7	0	11	0
19	0	16	0	14	0	15	1	3	0	3	1	18	1	11	0
8	0	15	0	5	2	6	5	5	3	13	0	3	0	16	0
7	0	7	3	8	0	5	0	2	0	12	0	17	0		
15	0	5	0	11	0	8	1	10	0	17	0	4	0		
17	3	15	0	15	0	1	0	11	0	15	2	10	0		
14	4	15	0	9	1	6	1	5	0	6	0	12	4		
11	9	9	0	5	0	10	0	10	1	11	1	15	0		
23	4	12	0	12	6	11	2	3	1	12	0	10	1		
8	1	9	0	16	1	17	0	1	0	16	0	8	1		
15	2	12	3	14	3	10	0	11	4	7	0	17	0		
								10	0	3	0	6	0		
				Total		907	64							1194	94

Decrease in Production.—Table 10 shows the number of bales of cotton produced by each county in the State since 1907. These figures are taken from the records published by the Bureau of Census, U. S. Department of Agriculture. Though the figures show a general decrease in cotton production, they do not indicate fully the amount of damage

TABLE 10.—QUANTITY OF COTTON, EXCLUSIVE OF LINTERS, GINNED IN MISSISSIPPI FROM THE CROPS OF 1907 TO 1916.

	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916†
Adams	20,455	14,155	1,700	1,062	2,204	1,246	1,106	1,519	1,200	
Alcorn	6,301	8,611	5,030	7,978	10.553	7.719	10,170	13,379	10,091	3,692
Amite	25,568	25,889	14,063	3,533	1,398	2,736	2,586	2,846	2,947	3,561
Attala	23,387	21,367	13,696	21,122	21,431	12,717	10,710	9,978	6,860	1.319
Benton	7,295	8,445	4,447	6,975	8,253	6,141	8,535	9,787	7,274	2,898
Bolivar	68,593	85,466	56,131	71,175	54,792	77,558	112,755	107,485	92,563	62,369
Calhoun	11,359	13,227	8,671	9,249	14,665	10,750	13,026	11,134	7,901	841
Carroll	20,613	24,564	14,263	19,255	19,705	16,080	16,154	15,287	9,363	2,992
Chickasaw	16,671	23,033	13,825	14,296	20,708	15,579	20,492	16,925	9,782	3,102
Choctaw	8,476	9,263	5,160	7,542	9,345	7,172	5,792	4,477	2,776	524
Claiborne	24,183	21,397	8,970	4,931	4,341	3,760	4,186	4,896	3,807	2,730
Clarke	9,891	12,837	8,674	10,122	12,965	4,883	1,654	2,438	2,097	
Clay	16,807	18,972	9,520	14,455	14,014	10,556	14,695	11,241	4,979	1,837
Coahoma	49,719	67,615	49,811	51,015	43,127	63,865	80,105	87,510	68,350	43,990
Copiah	30,689	32,233	19,448	14,265	5,853	2,545	2,540	3,855	2,482	2,658
Covington	6,670	9,540	7,890	8,924	5,218	2,755	2,166	2,895	2,052	952
De Soto	22,098	29,887	22,740	18,388	29,938	21,100	28,889	30,308	26,465	17,271
Forrest	2,147	3,478	2,803	3,361	2,382	852	979	1,612	873	
Franklin	15,045	15,064	5,451	1,314	690	608	600	1,150	890	
George				270	264					
Greene	383	902	692	414	431					
Grenada	11,911	16,085	8,988	9,901	15,573	12,213	13,706	11,681	8,774	1,715
Hinds	51,767	46,860	31,035	30,797	21,585	17,798	18,641	21,391	16,258	8,337
Holmes	50,802	48,389	29,836	42,406	34,819	30,274	35,789	32,778	23,229	10,027
Issaquena	15,446	11,650	11,925	13,332	9,404	8,853	5,858	6,165	5,535	739
Itawamba	9,097	9,850	7,063	7,528	11,197	8,330	11,014	11,325	9,195	716
Jasper	12,106	16,080	11,259	13,887	12,530	4,628	2,640	3,609	3,314	602
Jefferson	22,955	21,251	8,041	3,593	4,565	3,400	2,986	3,740	3,116	2,870
Jefferson Davis	9,661	14,920	12,124	11,621	6,272	3,698	3,561	5,049	3,169	2,034
Jones	8,501	13,464	10,220	12,163	10,842	5,103	3,540	4,727	3,544	630
Kemper	21,837	19,807	12,843	18,772	21,224	17,823	12,547	9,451	6,198	797
Lafayette	15,176	18,068	12,449	11,834	15,811	12,423	14,537	14,599	11,520	2,037
Lamar	1,647	3,065	2,470	2,693	1,373	231	359	829	301	
Lauderdale	20,322	22,315	14,848	19,257	24,044	16,145	7,035	4,640	3,697	412
Lawrence	8,633	12,053	9,994	6,383	2,495	2,162	3,179	5,020	4,753	3,306
Leake	17,357	14,563	8,523	14,220	13,577	7,653	5,835	6,752	4,912	1,505
Lee	17,032	23,917	16,594	19,869	22,561	20,297	29,426	25,934	20,553	2,862
Leflore	41,988	61,395	38,061	45,592	43,693	50,884	71,631	55,331	38,183	26,163
Lincoln	10,261	22,222	14,712	6,552	2,157	2,791	4,237	7,629	6,132	4,244

Lowndes	22,009	22,394	13,881	21,426	20,946	17,754	24,069	20,877	8,826	1,150
Madison	35,306	29,749	20,780	30,626	25,027	18,214	16,234	18,229	13,233	†6,434
Marion	7,171	9,732	7,816	5,884	2,380	1,131	913	1,168	1,803	
Marshall	20,607	23,935	14,967	21,123	23,624	19,725	22,912	26,270	20,459	10,501
Monroe	27,657	31,402	18,044	22,505	26,856	19,361	30,829	29,045	15,106	3,052
Montgomery	16,869	19,199	11,338	17,087	16,579	11,119	11,070	10,667	6,971	1,068
Neshoba	13,766	15,205	10,176	16,119	18,318	11,140	6,165	4,991	4,706	974
Newton	17,899	20,475	12,507	17,698	19,462	6,948	2,526	2,714	3,602	926
Noxubee	28,613	27,697	17,165	27,489	21,688	18,218	24,503	18,806	8,492	3,813
Oktibbeha	11,443	13,045	7,625	12,927	12,221	9,918	13,312	8,556	3,258	1,023
Panola	31,478	40,026	25,502	20,799	33,102	29,019	35,360	34,846	28,548	14,764
Pearl River	539	1,223	862	396	53					
Perry	1,016	1,577	1,360	1,439	1,524	466	697	1,047	356	
Pike	22,047	26,845	21,234	9,121	3,742	3,835	4,182	5,383	4,562	3,823
Pontotoc	12,147	15,826	10,777	10,889	16,062	13,788	16,812	19,444	13,791	1,436
Prentiss	11,533	13,513	8,662	10,832	12,813	11,166	14,440	16,627	13,103	3,883
Quitman	9,260	15,775	11,110	11,792	14,475	16,244	19,881	20,797	19,715	14,754
Rankin	18,338	18,472	12,878	16,117	7,807	2,608	2,073	2,999	2,539	1,393
Scott	12,039	11,933	7,921	11,018	8,658	2,058	1,290	1,868	2,021	
Sharkey	20,581	19,671	18,849	22,136	15,944	13,224	20,178	17,194	18,208	4,363
Simpson	11,416	14,545	10,758	12,277	5,479	2,791	3,362	4,679	3,076	2,010
Smith	11,029	13,716	10,702	13,358	8,743	3,659	2,827	3,699	2,592	1,310
Sunflower	41,786	55,374	37,653	50,715	48,003	59,047	89,770	78,064	58,877	42,623
Tallahatchie	27,531	39,394	26,155	32,467	37,808	39,086	49,176	50,203	36,038	23,175
Tate	16,679	21,894	14,862	11,954	17,673	14,814	20,800	23,406	19,116	12,137
Tippah	7,658	9,856	5,500	8,969	10,726	8,403	10,684	12,720	12,245	4,119
Tishomingo	4,366	5,544	4,013	5,730	8,209	6,593	8,191	10,895	7,216	2,059
Tunica	23,148	38,534	27,073	24,084	29,519	25,826	35,338	37,679	34,883	18,854
Union	12,177	12,974	7,915	10,669	13,098	10,867	13,238	14,973	13,897	2,416
Walthall*								3,454	3,433	2,405
Warren	19,002	11,702	11,329	8,395	8,177	5,684	7,602	9,130	7,640	2,481
Washington	65,197	60,523	60,522	63,485	45,441	50,818	87,412	68,966	52,647	26,871
Wayne	5,577	6,135	4,414	4,221	5,643	2,773	2,217	3,385	1,934	149
Webster	9,943	11,504	8,059	11,086	13,698	10,533	11,342	9,283	6,072	586
Wilkinson	23,128	17,720	4,358	1,186	1,628	936	1,075	1,795	1,398	
Winston	13,410	13,773	7,736	13,438	14,385	11,750	8,346	5,484	3,480	552
Yalobusha	15,265	19,471	12,265	11,127	18,594	14,819	18,394	15,842	11,306	1,335
Yazoo	52,609	46,531	32,181	40,950	24,767	16,437	30,469	31,344	24,709	9,741
All other	163	442	186	524	195	276	491	1,262	516	2,742
The State	1,442,881	1,620,325	1,073,105	1,212,104	1,169,066	1,004,376	1,251,841	1,217,883	925,509	448,649

*Walthall County organized from parts of Marion and Pike. †Number of bales ginned prior to October 18.

done by boll weevils for cotton acreage has been increased. Hinds*, using average yields per acre for five-year periods both before and after the advent of the weevil, estimates that there has been an average decrease of 37.8 per cent in production per acre in States or regions wholly infested. This decrease holds in spite of the two facts that better cultivation is now given cotton than formerly and that better varieties are grown. In the future, as in the past there will, doubtless, be fluctuation from year to year in damage done. Areas favored with dry weather during July or low temperatures during the winter, will produce better crops than the average, but with the advent of unfavorable weather, will produce poor crops.

HOLLY SPRINGS STATION RESULTS 1916.

During the past season the Holly Springs Station carried on variety tests with cotton on both hill and valley land, and certain spacing experiments. The weather as a whole was fairly favorable for growing cotton, but the yields were lower than those of several years because of damage done by boll weevils. They began damaging cotton considerably about the middle of August and were plentiful enough by the middle of September to stop flowering. No top crop was made.

VARIETY TESTS.

On Valley Land.—The cotton in the test on valley land was planted on crimson clover sod turned on April 17. The first planting was made April 25, but it was found necessary to plant over on May 12. One thousand pounds of rock phosphate was applied before turning under the clover. In addition to this, two hundred pounds of fertilizer consisting of a mixture of three parts acid phosphate and one part cottonseed meal was applied at the time of first planting. One-thirteenth acre of each variety was planted in 6 one row plats, rows 4 feet apart; and plants were 12 inches in drill. Yield for this test and various other data are given in table 11, page 21. (See College Station variety test discussion for note on stapling, prices, lint per cent, etc.)

On Hill Land.—The results of the Hill variety tests conducted in the past three years are shown in table 12. These results will probably be of considerable interest to planters farming hill lands.—(See table 12 on page 22.)

Six one row plats of each variety, occupying approximately one-twentieth acre, were planted each year. In 1914 and 1915, one hundred pounds of cottonseed meal and two hundred pounds of acid phosphate were used on each acre. In 1916 one hundred pounds of meal and three hundred pounds of phosphate were used. The same tract of land was used in 1915 and 1916. The difference in yields is due mainly to weevil damage. Boll weevils were numerous the latter part of the season of 1916.

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* *Boll Weevil Effect upon Cotton Production*, by W. E. Hinds. Bulletin No. 178, Ala. Agr. Expt. Sta., July 1914.

TABLE 11.—VARIETY TEST ON VALLEY LAND, 1916.

VARIETY.	Plat Yields at Different dates of picking.				Total lbs.seed cotton per acre	Per cent lint.	Length of staple in inches.	Value of lint per lb. in cents.	Lbs.of lint per acre	Character of staple.	Value of seed per acre at $60 a ton.	Total value per acre.	Rank in value per acre.
	Sept. 20	Oct. 12	Nov. 1	Nov. 28									
Dodds' Prolific	18	51	38	16	1599	32.5	Full 1 1/16	22½	519.6	Good	$ 29.38	$ 146.29	11
Trice	35	58	39	12	1872	28.9	1 1/16	22	540.8	Good	39.93	158.90	8
Wannamaker-Cleveland	11	51.5	39.5	15	1521	34.4	7/8	20	523.2	Fair	29.93	134.57	14
Cleveland Big Boll	6	39	42	10	1261	31.7	1	20	399.7	Good	25.83	107.76	19
Cleveland-027-11-24	12.5	54.5	50.5	15	1723	30.8	1 1/16	22	531	Fair	35.76	152.58	9
Cook	7	53	39	17	1508	34.2	1	20	515.7	Good	29.76	135.48	13
Triumph	10	55	41	19	1625	35.5	1 1/8	23½	574	Good	31.53	166.42	4
Miller	12	53.5	42	18	1632	31.7	Full 1 1/8	25½	517	Fair	33.45	164.28	5
Lone Star (U. S. D. A.)	8.5	46	46	15	1502	34.4	Full 1 1/8	25½	516	Good	29.58	161.16	7
Lone Star-15	18	61	29	16	1612	34.7	1 3/16	27½	559	Wasty	31.59	185.31	1
Holdon	5	33	24	14	995	33.5	1 3/16	27½	333	Fair	19.86	100.33	20
Polk	16	49	34.5	7	1385	27.6	Full 1 3/16	29½	382	Good	30.09	142.78	12
Unknown	22	50	35	14	1573	29.1	1 1/4	30	457.7	Good	33.45	170.76	3
Columbia (U. S. D. A.)	4	42	32	15	1209	28.1	Full 1 1/4	30½	339	Fair	26.10	129.49	16
Express	29	48.5	31.5	7	1508	26.5	1 3/16	27½	398.7	Good	33.27	122.91	17
Express-122	31	51	34	6	1586	26.3	1 3/16	27½	416	Good	35.10	149.50	10
Express-350	25	77	33.5	5	1827	26.4	Full 1 3/16	29½	481.3	Good	40.37	182.35	2
Express-341	31	57	32	7	1573	30.1	1 3/16	27½	474	Good	32.97	163.32	6
Sunflower	9.5	32.5	43.5	7	1203	26.1	1 3/8	34	315	Fair	26.64	133.74	15
Panther Burn	3	35	41.5	5	1105	27.1	Full 1 1/4	30½	299	Good	24.18	115.37	18

TABLE 12.—VARIETY TESTS ON HILL LAND.

1914 RESULTS.

VARIETY.	Plat yield Sept. 10	Plat yield Oct. 12	Plat yield Nov. 5	Total lbs. seed cotton per acre	Money value per acre	
Trice	80	39	6.2	1024	33.75	
Wannamaker-Cleveland	82.5	62	8	1247	46.23	
Cleveland Big Boll	54	57	11.2	1000	41.16	
Sproull's Big Boll	64	82	14	1309	53.11	
Express	42.5	55	6.6	852	35.59	

1915 RESULTS.

VARIETY.	Plat yield Sept. 4	Plat yield Oct. 11	Plat yield Dec. 6	Total lbs. seed cotton per acre	Money value per acre	
Trice	16	37	10.5	1270	59.35	
Wannamaker-Cleveland	10	37	16.5	1270	65.52	
Cleveland Big Boll	10	38	24.8	1450	72.20	
Sproull's Big Boll	4.5	31	34.5	1400	79.29	
Express	9	33	15	1140	55.85	

1916 RESULTS.

VARIETY.	Plat yield Sept. 23	Plat yield Nov. 21		Total lbs. seed cotton per acre	Money val. ue per acre	Three-year average of money value
Trice	30	9		780	66.21	53.13
Wannamaker-Cleveland	28	15		860	76.08	62.61
Cleveland Big Boll	23.5	16		790	66.26	59.87
Sproull's Big Boll	16	14		600	59.54	63.98
Express	28	8		720	78.34	56.59

GOOD VARIETIES FOR THE HOLLY SPRINGS DISTRICT.

For hill land, Wannamaker-Cleveland, Miller, Triumph, and Cleveland Big Boll are recommended. For valley land Wannamaker-Cleveland, Trice, Express, and Unknown are good varieties. Express and Unknown are staple varieties and require rather fertile soil.

SPACING TESTS, 1916.

In the spacing tests on hill land ten tons of stable manure, three hundred pounds of acid phosphate, and one hundred pounds of cotton-seed meal per acre were used as fertilizer. There were two rows of each variety in each of the three six row plats. Triumph came up to a poor stand. Boll weevils appeared about the time cotton began to form. Squares were picked up once a week for three weeks.

TABLE 13.—SPACING EXPERIMENTS, 1916.

VARIETY.	Width of row.	Distance in drill.	Plat Yield Sept. 20.	Plat Yield Nov. 8.	Total lbs. seed cotton per acre.
Triumph	3 ft.	9 in.	22	22	1135
Cleveland Big Boll	3 ft.	9 in.	27	23	1290
Sproull's Big Boll	3 ft.	9 in.	20	25	1161
Triumph	3½ ft.	12 in.	30	29	1304
Cleveland Big Boll	3½ ft.	12 in.	43	30	1632
Sproull's Big Boll	3½ ft.	12 in.	30	30	1326
Triumph	4 ft.	16 in.	32	34	1274
Cleveland Big Boll	4 ft.	16 in.	44	32	1467
Sproull's Big Boll	4 ft.	16 in.	30	30	1158
Sproull's Big Boll	4 ft.	9 in.	40	25	1255
Sproull's Big Boll	3½ ft.	12 in.	37	22	1304
Sproull's Big Boll	3 ft.	16 in.	32	21	1367

As may be seen from table 13, the best yields were secured from the 3½ foot rows with plants spaced 12 inches in the drill. Spaced in this way there are approximately 12,000 plants on an acre. The varieties used in this test are all rather leafy and growthy. The land, too, was rather highly fertilized. On poorer land and with less growthy plants the results would probably have been different.

CULTURAL METHODS FOR HOLLY SPRINGS DISTRICT.

New Methods Needed.—Now that the boll weevil has reached the northern boundary of the State, our methods of growing cotton will have to be changed.

1. The lands must be improved. Soil washing should be checked. The fertility of the soil should be increased.

2. No more late varieties of cotton should be planted; and no more late plantings of cotton made.

3. The maturing of the crop should be hastened in every way possible. Two hundred pounds of acid phosphate per acre would do much to enrich the soil, and frequent shallow cultivations are necessary to bring about very satisfactory results in the northern hill section of the State.

4. The acreage per horse power should be reduced at least one-third. More attention should be paid to the growing of crops to supply farm and home needs.

Turning of Soil.—Contrary to the teachings of agriculture, we have found fall plowing on rolling hill lands not advisable in this section unless a cover crop is planted or a heavy crop of vegetable matter is turned under. On slightly rolling or valley land this will not apply, though the winter cover crops will not be less profitable. The damage from washing is, of course, much less where the soil is properly terraced.

In the spring turn, disc, and harrow the land. In case any soil has been turned and left barren in the fall, discing is all that is necessary. With a shovel plow or marker lay off rows the width desired. Apply the fertilizer to the furrows. Run a middle breaker between the furrows,

to cover the fertilizer and to complete the rows. Harrow the rows with a section harrow until they are only slightly elevated. Do this, if possible, ten days or two weeks before planting time, which in the Holly Springs District is about the 20th of April. The seed bed should be fine. If thorough breaking and fertilizing is done early enough, the rains will settle the soil firmly by planting time. Ahead of the planter run a section harrow to break the crust. Sow about a bushel of seed to the acre; this is the amount the Holly Springs Station has found advantageous.

Spacing.—According to the spacing test described on page 23 of this bulletin, cotton should be spaced as follows:

On thin land the rows should be barely three feet wide, and the plants should be about ten inches apart in the row.

On medium fertile soil the rows should be three and one half feet wide, and the plants about twelve inches apart in the row. Where double horse cultivators are used, this is the most desirable width, as the cultivator will cover the entire middle.

On rich valley land where the stalks grow tall, the rows may be four feet wide, and the plants sixteen inches apart in the row.

Cultivation.—The first cultivation may be made with a section harrow or a weeder. A side harrow gives very satisfactory results. Any tool, in fact, that will break the soil shallow and cover the widest space between the rows is desirable. Cultivations should be shallow and frequent; if practicable, once a week, certainly as soon as possible after each rain. Cultivations should be continued late into the season to encourage top growth to furnish food for the weevil; otherwise the weevil will do greater damage to the large bolls. Frequent shallow cultivations preserve moisture and destroy grass while young, but they do not injure the roots of the plants. Shallow culture, furthermore, is less expensive and more effectual than the old method in the cultivation of any crop.

How to Combat the Weevil.—In combating boll weevils it should be remembered that their sole food is cotton. The first weevils attack the young cotton in the bud. They can be picked by hand if cheap labor is available. Others emerging, then, from winter quarters for the next month or six weeks, attack the crop. When the infested parts of the field are located, picking by hand may be restricted to those parts. This work should be done twice a week. On large plantations where the hibernating places are few and labor is expensive, the managers have abandoned hand picking, and depend on early planting of early maturing varieties and frequent cultivation.

The weevils spend the winter in many places—in straw stacks, on ditch banks, around houses, in stumps and old logs, in woods, and in any rubbish on the farm. Since under favorable conditions, few survive the winter, the destruction of hibernating places would naturally decrease the number of these farm-wrecking pests.

Destruction of Cotton Stalks.—All the cotton stalks should be destroyed as early in the fall as possible—certainly before frost. Where the weevil gets the top crop and harvesting is rushed, this can be done easily. Live stock parked on the land in sufficient numbers will destroy the stalks in a very short time. Where hay is scarce, the stalks

can be cut or uprooted and ricked for forage for cattle. The stalks may be cut and turned under four or five inches, and the land seeded to some winter crop. The stalks may be cut and left upon the ground. This will cut off the food supply of the weevil but will not prevent the thousands of immature weevils from maturing. It will also assist in preventing soil washing and will hasten the decay of the stalks where fall plowing will not be done.

To cut and burn the stalks should be the last resort; this will destroy from five to seven dollars worth of nitrogen per acre. This practice should have been abandoned long ago; our soils are far too low in both nitrogen and organic matter. If the cotton middles were seeded to crimson clover in September, the practice of burning the stalks would not be so injurious.

Winter Cover Crops.—The practice of planting winter cover crops, not only on cotton lands but also on other cultivated lands, will be conducive to grain growing and live stock growing, which is the hope for the cotton states.

Crimson clover, or oats, or oats and vetch, or rye may be planted between the cotton or corn rows from September to October 15th. Rye should be put on the thinnest land.

Oats, or oats and vetch, or rye can be planted on land turned before October 15.

Wheat or rye may be sown on land turned between the 15th of October and the 15th of November.

RESULT FROM THE DELTA STATION, 1916.

During the season of 1916, the Delta Station carried on several experiments with cotton. Among the experiments were those in spacing, acclimatization, variety testing, and breeding.

VARIETY TEST.

The variety cottons were planted on April 11th and 12th, on soil of moderate fertility. They came up to a fair stand and made good growth during the first part of the season. Continued rainy weather in July caused much shedding and damaged the crop considerably. Boll weevils appeared during July and by the middle of August were numerous enough to stop flowering. Many of the forms put on during the preceding ten days failed to make anything on account of the weevils attacking the young bolls. Because of bad weather and weevils, the yields were low.

Column 1 of table 14 gives actual yields of seed cotton per acre; column 2 gives yields based on a perfect stand of plants. (See College Station discussion, page 5 of this bulletin, for an explanation of methods used in determining weights for a perfect stand. The notes given there in reference to lint per cent, stapling, prices, etc., are applicable also to this test.)

TABLE 14.—VARIETY TEST AT DELTA STATION, 1916.

VARIETY.	Lbs. of seed cotton per acre	Pounds of Seed Cotton per acre on basis of a perfect stand.	Per cent lint	Length of staple in inches	Value of lint per lb. in cents	Lbs. of lint per acre	Character of staple	Value of seed per acre at $60 a ton	Total money value per acre	Rank in money value	Weight of 100 Bolls in oz.	Weightingrams of lint on 500 seeds.
Dodds' Prolific (from Ky.)	723	786	32	Full 1	21	251.5	Good	$16.03	$68.84	26	25	28.5
Trice-22	879	648	28.5	1 1/8	23½	273.8	Good	20.61	84.95	14	21.6	23.2
Trice U. S. D. A.	850	898	27.8	Full 1 1/16	22½	249.6	Good	19.45	75.60	20	21.7	21.4
Calhoun (Georgia)	596	636	32.6	Full 1 1/16	22½	207.3	Fair	12.86	59.50	32	21	22.4
Wannamaker-Cleveland	798	923	35.6	1	20½	328.5	Fair	17.83	85.17	13	25	32
Cleveland Big Boll	759	823	31.3	1 1/16	22	257.5	Good	16.96	73.61	21	31	32.4
Cleveland-027-11-24	823	1023	30.8	1 1/16	22	315	Good	21.24	90.54	7	27.7	30.2
Cook	730	780	33.6	7/8	20	262	Fair	15.54	67.94	30	25.2	29.2
Triumph (from Tex.)	584	680	34.5	Full 1 1/16	22½	234.6	Good	13.36	66.14	31	31.4	35.4
Triumph (from Expt. Sta.)	628	680	34.3	1 1/8	23½	233.2	Good	13.40	68.20	29	31.4	35.4
Miller	797	905	30.6	1 1/8	25½	276.9	Good	18.88	89.48	8	30.3	31.4
Lone Star U. S. D. A.	535	582	34	1 1/8	23½	197.8	Fair	9.96	57.44	33	31.1	37.1
Lone Star-11	634	736	31.4	1 1/8	23½	230.1	Good	15.17	69.24	24	36.5	36.1
Lone Star-15	770	842	34.2	1 3/16	27½	287.9	Fair	16.65	94.53	4	30.3	32.8
Lone Star-132	992	1154	26.3	1 3/16	27½	303.5	Good	25.51	108.97	1	27	21.1
Holdon	292	402	29.2	1 3/16	27½	117.3	Fair	8.54	40.79	38	31.8	37.4
Polk	763	830	27.3	Full 1 3/16	29½	226.5	Good	18.10	84.91	16	21.7	19.9
Unknown	841	898	28	Full 1 3/16	29½	251.4	Good	19.39	92.55	5	23.8	24.3
Darden	732	798	29.6	Full 1 1/8	25½	236.2	Good	16.85	77.08	19	24.5	24.3
Columbia U. S. D. A.	589	661	27.2	Full 1 1/4	30½	178.7	Good	14.55	69.05	25	25.2	25.1
Columbia (Sherard)	507	576	26.8	1 3/16	27½	154.3	Good	12.65	55.08	34	23.6	24.8
Columbia X Express B-32	800	867	28.6	1 3/16	27½	247.9	Fair	18.60	86.77	11	25.6	24
Express-122	769	835	26.1	1 3/16	27½	217.9	Good	18.54	78.46	18	21.3	21.5
Express-350	961	1073	26.8	Full 1 3/16	29½	287.5	Good	23.56	108.37	2	22.8	22.9
Express-314	892	973	28.9	1 3/16	27½	281.1	Fair	20.75	97.05	3	21.5	21
Express-341	799	867	28.4	1 3/16	27½	246.2	Good	18.62	84.94	15	21.2	22.5
Express (Low)	855	935	26.2	1 3/16	27½	244.9	Fair	20.73	87.87	9	19.5	18.7
Express (Allen's Big Boll)	716	786	27.1	Full 1 3/16	29½	213	Fair	17.19	80.02	17	23	21
Lone Star X Express A-311	870	955	29.4	Full 1 1/8	25½	280.7	Poor	20.31	91.88	6	26.6	29
Foster-120	694	767	31	Full 1 3/16	29½	237.8	Good	15.87	86.02	12	25	27.8
Sunflower X Express A-312	679	736	24.8	Full 1 3/16	29½	182.5	Good	16.60	70.43	22	20.6	18.7
Sunflower (from Schaefer)	526	566	26.6	1 3/16	27½	150.5	Fair	12.46	53.84	35	20.5	18.4
Sunflower (from Expt. Sta.)	578	630	25.2	1 3/8	34	163.8	Fair	14.04	69.73	23	19.8	19.9
Panther Burn	643	680	25.7	Full 1 1/4	30½	174.7	Good	15.24	68.52	28	19.8	18.4
Hartsville-9	407	459	27.3	Full 1 1/4	30½	125.3	Good	10.01	48.22	37	25.7	26.7
Webber-82	710	773	29.2	1 5/16	31½	225.7	Good	16.50	87.59	10	27.2	28.1

GOOD VARIETIES FOR THE DELTA DISTRICT.

Express continues to rank first as a profitable cotton for Delta conditions in general. It is fairly resistant to disease, extra early and prolific, and a good premium is paid for its staple. Some of our new strains, like Express-350, give promise of being considerably better than the parent strain. Allen's Unknown, which every year ranks near the first, is an excellent cotton. Polk has done only fairly well in our tests the two years we have tested it, yet we have seen fields of excellent Polk cotton. This cotton is lacking in uniformity and type. Foster-120 is a good cotton for rich land that is free from cotton wilt disease. Lone Star-132 has made a good showing in our tests the past two years. (Seed of Express-350, Express-314, and Lone Star-132 are not available for distribution.)

Preliminary Variety Test.—The main results from the preliminary variety experiment, conducted at the Delta Station, in 1916, appear in table 15.

The land on which this test was conducted was better for cotton growing than the land on which the regular variety test was carried on and consequently the yields were somewhat better. Wannamaker-Cleveland and Express-122 were used as checks in the test.

TABLE 15.—PRELIMINARY VARIETY TEST, DELTA STATION, 1916.

VARIETY.	Lbs. of seed cotton per acre.	Lbs. of seed cotton per acre on basis perfect stand.	Per cent lint.	Length of staple in inches.	Value of lint per lb. in cents.
Wannamaker-Cleveland	1098	1190	35	1	20½
Calhoun (Banks)	813	869	29.7	1 1/8	23½
Gholston	716	765	27.9	1 3/16	27½
Express-122	1043	1091	26.8	1 3/16	27½

VARIETY.	Lbs. of lint acre.	Character of staple.	Value of seed per acre at $60 a ton.	Total money value per acre.	Rank in money value per acre.
Wannamaker-Cleveland	416.5	Fair	$23.20	$108.58	1
Calhoun (Banks)	258.0	Fair	18.33	78.99	3
Gholston	213.4	Fair	16.54	75.11	4
Express-122	282.3	Good	24.26	101.89	2

Spacing Experiment.—A cotton spacing experiment was made at the Delta Station, in 1916. The cotton was planted on Delta loam soil that was in a high state of fertility, having grown a crop of legumes the year before. Each of the four varieties was planted in four plats of five rows each. All plants of each plat were spaced alike. All rows were 3 feet, 9 inches wide. The rows marked "unthinned" were left just as spaced by the planter and were consequently very thick. All varieties made rank growth and attained a height of from 4 to 6 feet. Lone Star and Columbia are rather leafy varieties and only medium early. Boll weevils damaged this cotton very little prior to the first of August. Only the three middle rows were weighed, the average weights of these rows being the weights given in table 18.

TABLE 18.—COTTON SPACING EXPERIMENT, DELTA STATION, 1916.

VARIETY.	Distance in drill.	Average number pounds of seed cotton per row.	Pounds of seed cotton per acre.
Express-41	Unthinned	19	1330
Express-41	6 inches	21	1470
Express-41	12 inches	20	1400
Express-41	18 inches	21	1470
Trice	Unthinned	24½	1715
Trice	6 inches	25	1750
Trice	12 inches	24	1680
Trice	18 inches	23	1610
Lone Star	Unthinned	11	770
Lone Star	6 inches	11½	805
Lone Star	12 inches	16	1120
Lone Star	18 inches	15	1050
Columbia	Unthinned	13½	945
Columbia	6 inches	13½	945
Columbia	12 inches	14½	1015
Columbia	18 inches	15½	1085

Though the results from this experiment are not conclusive, it appears that with the early dwarf varieties, like Trice, close spacing will give the highest yields, especially where only the early fruit can be counted on. The later, large leaved varieties appear to yield better if given more space.

COTTON CULTURE IN THE DELTA UNDER BOLL WEEVIL CONDITIONS.

Cotton growers in the Delta are eager to learn how to farm under boll weevil conditions. An urgent demand for information is constantly reaching the investigators at the Delta Station. The opinion of these investigators, based on experience during the past five years, may be of some value to the cotton growers.

This opinion, expressed in the following paragraphs, is unfortunately, though necessarily composed of generalizations. Fixed rules are impossible; too many factors over which man has no control play important parts in the production of a cotton crop; and the judgment of the individual farmer makes success or failure in the cultivation of the crop. These factors operate—weevil or no weevil. The investigators can only offer the cotton growers their opinion of the best methods to follow under average boll weevil conditions.

To make the greatest success possible under boll weevil conditions the planter must do two things: First, he must fight the weevils; that is, he must do all possible to destroy the hibernating places, from which the weevils issue into the cotton fields in the spring. Secondly, the planter must put into practice the methods of cultivation that promise a heavy, early crop.

How to Fight the Weevil.—To decrease the number of weevils that live through the winter, we should strive to bring about two conditions, more or less within our control. First, in the fall we should remove the food of the weevils; second, we should destroy the hibernating places.

In the southern part of the Delta, where the crop usually light is harvested early, it is now both possible and practicable to control the supply of weevil food in the fall. The cotton stalks should be destroyed before frost. When it is possible the stalks should be grazed by the cattle. When grazing is not practicable, especially on lands low in organic matter, the stalks should be plowed under.

In the part of the Delta where yields are still too heavy to pick before a killing frost, the stalks, of course, cannot be destroyed in time to cut off the source of food supply. Under such conditions, there is, so far as we are aware, no practicable way of cutting the weevils' food supply short before frost time.

In all parts of the Delta it is possible to destroy many of the hibernating places. If hibernating places were destroyed whenever practicable, the boll weevil acreage would be continually lessened. Evidence shows that dead timber of all kinds is our greatest menace in the fight against the boll weevil. Some weevils, it is true, spend the winter in cotton seed, in hay, and in buildings. These, however, are few in comparison with those hibernating in hollow trees and dead timber. Whenever practicable, all such timber should be destroyed.

In the early summer, when the weevils first appear, a persistent picking of the weevils and the punctured squares will tend to reduce multiplication and lessen damage to the crop. How long this picking of weevils and punctured squares should continue, it is impossible to say; the picking should be governed by local conditions, such as supply and cost of labor and extent of infestation. Constant alertness against the early weevils is one of the most satisfactory means of weevil control.

Practical Methods.—Careful selection should be made of the land on which cotton is to be grown under weevil conditions. The growing of cotton should be undertaken only on that land which is well drained and separated farthest from timber. Under weevil conditions it is impossible to grow a crop of cotton on poorly drained, cold land.

Soils that are old and worn should, if drainage allows, be broken flat and thoroughly as early in the fall as possible. In the late winter the land should be "thrown" into beds at one furrow with a middle buster. In this condition it should stand until planting time. This method ensures thorough breaking of the soil; but, in an extremely wet winter, it necessitates very late bedding, and prevents the thorough draining that fall bedding gives. Soils that are in good condition should be bedded at the first operation in the fall. Just before planting time the beds should be run over with a disc harrow to freshen them up. The putting of land into beds in the fall aids drainage and allows the soil to warm up earlier in the spring. It also ensures a firm seed bed when planting time comes. Since cotton is a hot weather plant, any

reasonable effort to make the land warm early in the spring, will be well repaid in an early cotton crop. Since cotton is a tap rooted plant, it should have a firm seed bed.

At planting time harrows should go ahead of planters, to pull the beds down to the desired height and to scratch up enough loose dirt to cover the seed. The following directions are useful:

1. Plant plenty of seed. It is false economy to use less than enough for a good stand. Under boll weevil conditions it is highly important that a stand be secured as early as possible; not less than a bushel to the acre should ordinarily be planted.

2. When possible plant delinted seed. They can be planted more uniformly; and much better stands are secured. Delinted seed absorb moisture more quickly and consequently germinate more quickly than ordinary seed. In recent tests at the Delta Station, delinted seed surpassed undelinted seed in per cent of germination, and produced a stand in only half the time required by the undelinted seed.

3. Plant only the earliest and most productive variety of cotton adapted to your locality. At the Delta Station during the past season the highest yielding variety surpassed the lowest yielding by more than $50.00 per acre. Fifty dollars an acre is a good deal. Every planter should, therefore, look well to the variety of cotton he plants.

4. Use fertilizers discriminatingly. So far as experiments at the Delta Station indicate and so far as the investigators are aware, no form of commercial fertilizer makes cotton fruit early. Plenty of decayed vegetable matter in the soil, it is true, not only aids drainage, but warms the soil, and thus promotes early fruiting. Early fuiting is a quality inherent in the plant; it can be got only by careful selection.

Fertilizers in some instances increase the yield. The numerous tests made at the Delta Station, with fertilizers on old worn soil, indicate that nitrogen in some form materially increases the yield. Nitrate of soda, for example, applied lightly—25 to 50 pounds per acre before planting and 50 to 75 pounds per acre when the first forms appear—increased the results considerably. The growing and plowing under of legumes is the best method of improving old, worn soils. This method the Delta planter should employ.

Cultivation.—The cultivation of the cotton crop is very important. No fixed rule can be followed The season and the farmer's judgment must determine the distinctive method. Since cotton is a hot weather plant, any method that aids in making the soil warmer is desirable. Since the cotton plant has few lateral or feed roots until it has attained some size, it can without injury be cultivated closer and deeper than most plants. On old, worn soils it is not a bad idea to cultivate deep early in the spring in order to liberate as much food as possible for the plant later on. Cultivations should, however, become shallower as the season advances and the plant grows larger. On soils that are fertile, the cultivations should be as shallow and as few as possible—only those necessary to keep the weeds down. The last cultivations of a cotton crop are the most critical. They should be frequent enough to keep up soil moisture, and shallow enough not to disturb the cotton roots.

A number of good cultivators are on the market. It is impossible to say which is best. On the Delta Station farm, for early cultivations,

preference is given to the two-horse cultivator, used in the first weeks with the spring tooth attachments, and later with the small buzzard wing sweeps. When the cotton gets too large for a two-horse cultivator, preference is given either to the one-horse Planet Junior cultivator with the small buzzard wing sweeps or to the one-horse spring tooth cultivator. The implements used at the Delta Station will not suit all conditions. The farmer should use the implements which suit the conditions under which he farms. When grass is bad and where considerable one-horse cultivation is done, the double shovel, with solid sweeps or with buzzard wing sweeps, is a good implement. Like all other implements, it should be used with good judgment.

Spacing of Cotton.—Great diversity of opinion obtains in regard to the proper spacing of cotton under boll weevil conditions. From recent tests, made at the Delta Station and at other places in the boll weevil territory, it is evident that too much space is commonly given for best yields. Recent tests made at the Delta Station indicate that on the average worn soils of the Delta the best spacing to be this: for the early maturing, dwarfy cottons, from three and a half to four foot rows, with the cotton thinned to six or ten inches in the drill; for the late big boll varieties, from four to four and a half foot rows, with the cotton thinned to 12 or 18 inches in the drill.

Under boll weevil conditions, only the earliest and most prolific varieties should be planted and only the most advanced methods of cultivation should be employed.

GENERAL DISCUSSION.

TABLE 16.—VARIETY AVERAGES FROM THE THREE STATIONS.

VARIETY.	Lbs. of seed cotton per acre.	Per cent lint.	Lbs. of lint per acre	Val. of seed at $60 per ton.	Total money val. per acre.	Rank money value.
Dodds' Prolific	941	32	320.3	$ 19.24	$ 89.74	11
Trice U.S.D.A.	1100	28.5	331.5	24.82	98.51	6
Wannamaker-Cleveland	888	34.8	340.2	19.13	87.72	13
Cleveland Big Boll	802	31.4	270	17.63	73.63	17
Cleveland-027-11-24	991	30.6	339.6	23.00	96.86	7
Cook	924	34	324.2	19.01	84.52	14
Triumph (Mebane)	849	34.2	327.5	18.32	93.63	10
Miller	975	31.3	325.8	21.53	103.48	5
Lone Star (U. S. D. A.)	825	34.3	291.5	16.52	88.78	12
Lone-Star-15	991	34.6	360.5	20.46	113.89	2
Holdon	491	31.1	175.8	11.21	55.30	18
Polk	905	27.8	255.5	20.30	95.63	8
Unknown	953	29.9	292	21.44	106.91	3
Columbia (U. S. D. A.)	737	27.5	212.3	17.11	80.69	15
Express-122	962	26.3	265.4	22.41	95.50	9
Express-350	1154	26.8	325.2	26.82	121.38	1
Express-341	1014	29.2	313	22.48	103.30	4
Sunflower (Schaefer)	725	26.8	200.2	16.56	79.79	16

TABLE 17.—RANK OF VARIETIES GROWN THE LAS T SIX YEARS ON BASIS OF MONEY VALUE PER ACI

VARIETY.	College Station						Holly Springs Station						Delta Station				
	1910	1911	1912	1914	1915	1916	1911	1912	1913	1914	1915	1916	1911	1912	1913	1914	191
Allen Long Staple	13																
Ashcraft Double Jointed			23					15	22					4	23		
Acala															20		
Broadwell's Double Jointed		15					12						20	4			
Brandon			8					6	21					34	19		
Brown's No. 1														35			
Black Rattler															45		
Bates																16	
Cook (Cook's)	3	4	3	9		16	18	14	2	8		15	18	30	5	13	
Cook's Improved No. 7	7																
Cook's Improved No. 9	1													25			
Cook's Improved No. 8	2																
Cook (Miss. Exp. Sta.)		9	4				19	13	16				11	32	39		
Cook's Improved No. 11	6																
Cook (Ala. Exp. Sta.)				5	10					6	23		20			12	5
Crawford's Big Boll														21			
Covington-Toole	5	5	12				8	26					8	41			
Cleveland No. 2	9																
Cleveland No. 1	10																
Cleveland No. 3	14																
Cleveland (Delta Sta.)														21			
Cleveland-027-11-24		19	5		17	24		12			20	9	16	15			21
Cl'v'd Big Boll(J. R. Cleveland)		18	2	12	12	27	9	9	11	9	5	19	9	13	14	10	11
Cleveland (Wannamaker)			1	8	5	26		3	1	11	7	13		6	2	7	14
Columbia		3	19	1		25	2	19	27	2		16	15		40	8	
Columbia (Sherrard)						28									16		
Columbia X Express																	
Christopher			15					11						26			
Calhoun									10						13		
Dixie		12	13				13	24	26				19	28	10		
Dodds' Prolific			9	13	14	15		4	19	13	22	11		2	32	5	19
Davis' Long Staple															36		
Dalrymple														10		9	
Day														29			
Dodds' Favorite															30		
Durango				10	13				18	1	16			14	17	17	18
Dodds' Long Staple														16	36		
Dat So											17						
Darden																	
Excelsior	15																
Express				3	1				6	3	13	17	1		3	1	13
Express-15					3						8						9
Express-122					2	8					2	10					6
Express-32						4											
Express-350						2						2					7
Express-341						3						6					
Express (Allen's B. B.)						12											
Express (Low's)																	
Express-314																	
Foster			11					21						11	28		
Foster (Haaga)									4						38		
Foster (College)									12								
Foster-11					7						12						
Foster-120					9	1					14						12
Fondren																	2
Gold Coin	20																
George																	37
Hite			17					25						40			
Hawkins			25					23						37			
Half and Half				6					9	7					1	11	
Haaga No. 2									23						24		
Hartsville															9		
Haaga No. 1															35		
Harris																	1
Hartsville-9																	38
Holdon						29						20					39
King		16					14						12				
Keenan														42	42		
Keno															22		
Kentucky Bender															33		
Kentucky Favorite																	2
Lone Star		7	7			23	20	7	14			7	4	43	25		34
Lone Star-11					4	17					9						24
Lone Star-15					16	5					11	1					6
Lone Star-132					11						15						2
Lone Star Express A-311																	
Magruder																	27
Mexican Big Boll	21																
Money Maker		6	20				1	20					21	17			
Mississippi Silk													22				

VARIETY	College Station						Holly Springs Station						Delta Station					
	1910	1911	1912	1914	1915	1916	1911	1912	1913	1914	1915	1916	1911	1912	1913	1914	1915	1916
...	.....	.....	.....	4	8	13	.....	.....	.....	5	4	5	.....	.....	8	4	12	.....
alf	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	.....	.....	.....
Mac Special	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37	.....	.....	.....
plier (Allen)	.....	.....	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	43	.....	.....	.....
Cain	.....	.....	26	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	12	.....	.....	.....	.....
y Day	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44	.....	.....	.....
er Burn	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	28
of Georgia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19	.....	.....	.....	.....
ss	.....	.....	.....	.....	6	7	.....	.....	.....	.....	.....	12	.....	.....	27	.....	15	16
proved King	19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
en-116	.....	2	22	.....	.....	.....	5	16	.....	.....	.....	.....	7	31	.....	.....	.....	.....
en	.....	.....	21	.....	.....	.....	.....	18	3	.....	.....	.....	.....	38	18	.....	.....	.....
ond Bender	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	.....	.....
e	.....	11	.....	.....	.....	.....	10	.....	15	.....	.....	.....	3	20	26	.....	.....	.....
ll	.....	.....	24	.....	.....	.....	.....	22	.....	.....	.....	.....	.....	36	.....	.....	.....	.....
ond Long Staple	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29	.....	.....	.....
ins	17	17	14	14	.....	.....	16	2	20	17	.....	.....	17	24	41	16	.....	.....
ns' Ideal	.....	.....	.....	16	19	.....	.....	.....	.....	16	23	.....	.....	.....	.....	6	25	.....
Loaf	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
wer	.....	1	18	2	21	18	1	27	25	10	3	14	13	3	34	14	20	36
A-312	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22
ll	.....	20	.....	.....	.....	.....	15	.....	.....	.....	.....	.....	23	.....	.....	.....	.....	.....
rough	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....
ph	4	.....	6	11	18	.....	6	10	7	12	10	.....	.....	.....	4	15	7	.....
ph (Gholston's)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....
ph (from Jas. Wade)	8	8	.....	.....	.....	.....	11	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....
ph(from Excel. S. Farm)	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ph(from Central Station)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39	.....	.....	.....	.....
ph (from Mebane)	4	14	.....	.....	.....	21	6	.....	.....	.....	.....	4	2	.....	.....	.....	.....	31
.....	.....	21	10	15	15	6	4	1	5	15	21	8	5	1	31	2	17	20
(from Central Station)	.....	.....	.....	.....	.....	.....	.....	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....
's 90 Day	.....	10	16	.....	.....	.....	3	5	24	.....	.....	.....	14	23	44	.....	.....	.....
nton	.....	.....	.....	.....	.....	.....	.....	33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ny	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....
266	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
Sam	18	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	11	.....	11	.....	.....	.....
own (Allen's)	.....	.....	.....	7	6	10	.....	.....	13	4	1	3	.....	5	6	3	10	4
s Early Prolific	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
's Wonder	.....	13	27	.....	.....	.....	17	8	.....	.....	.....	.....	10	27	.....	.....	.....	.....
er	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	21	.....	.....	.....
lerful (Haaga's)	.....	.....	.....	.....	20	.....	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	20	.....
er-49	.....	.....	.....	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
er-82	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10

Comparative Length of Staple of Varieties Grown at the Three Stations.—A very general belief among the cotton growers of the State is that the Delta lands will grow a longer staple than lands in other parts of the State. Evidence gathered by the Experiment Stations goes to show that the staple of a variety grown in the Delta (on the Station farm at Stoneville) is no longer than the staple of the same variety grown elsewhere in the State. For example, the Delta staple averages slightly shorter than the Holly Springs station staple, as will be seen by noticing table 19.

TABLE 19.—AVERAGE LENGTH OF LINT OF CERTAIN VARIETIES GROWN AT ALL THREE STATIONS FOR SIX YEARS.

STATION.	1911	1912	1913	1914	1915	1916	Six-year average	Av. length of fibers measured with rule 1915 cotton
	inches	inches	inches	inches	inches	inches	inches	inches
College	1.034	1.053	.973	.987	1.000	1.100	1.024	1.16
Holly Springs	.962	1.055	1.013	1.025	1.026	1.147	1.037	1.28
Delta	.940	1.046	1.031	1.025	1.010	1.130	1.028	1.17

About twenty of the standard commercial varieties of cotton are each year planted at each of the three experiment stations In most cases the seed is bought from the originator and in all cases the source is the same for three stations. Samples from the varieties grown at each station are ginned at the Central Station. Table 19 shows the average length of staple of the varieties grown at all three stations for the past six years. The length of staple each year was determined by professional classers. Some years the different sets of samples were stapled by different men; other years all the samples were classed by the same classer or classers. In 1916 all the samples were stapled by H. L. Eustis, of Greenville, Mississippi.

The staple of a part of the 1915 samples was measured accurately with a rule. The plan used was as follows: one hundred individual fibers of all lengths were drawn from each sample, wet, straightened out on a glass side, and measured carefully. The slide was held over a black velvet background so that the fiber might be seen to better advantage. The averages from these measurements are given in column 8 of table 19. It will be observed that the averages in this column run slightly higher than the ones in other columns; wetting the fibers and straightening them made them measure somewhat longer. The relative lengths for the three stations remain about the same.

Although the evidence presented here indicates that the staple of varieties in general is as long as when grown in the Hill Region of the State as in the Delta, it does not show that the staple cottons grow so well in the Hill District as in the Delta. They yield better when grown under Delta conditions.

Spacing Work with Cotton.—During the past season each of the three experiment stations did some distance work with cotton. The results, which are printed elsewhere in the bulletion, differ to some extent. See tables 4, 13 and 18.

At the College Station best yields were secured with the closest spacing; with three foot rows in the width-of-row test, and with twelve inch spacing in the drill in the distance-in-the-drill test. Close spacing has invariably given the best yields in tests conducted at this Station during the past eight years. The land was valley land of medium fertility. At the Delta Station the results secured were not conclusive. Different varieties were used. For Trice, a variety that produces small plants, a six-inch spacing in the drill seems to be the best. For larger growing varieties, like Lone Star and Columbia, greater distances appeared to be best. In no cases did the unthinned rows lead in yield, yet they bore well. The land on which the test was conducted was very fertile, being Delta land on which a crop of legumes was grown the year before.

At Holly Springs, best results were secured with medium close planting,—plants spaced twelve inches in three and a half foot rows. The different varieties used in the test were all of similar type and rather leafy and growthy. The land on which this cotton was grown was highly fertilized.

Considerable distance work with cotton was carried on by some of the southern experiment stations several years ago. Though the results are interesting and valuable, they are not altogether reliable, for the tests were conducted before the advent of the boll weevil and under

conditions different from the present. The results, moreover, differed so considerably that from them it is hardly possible to formulate any general rules for cotton spacing. The factors having a bearing on the question are numerous—type of soil, fertility of soil, variety of cotton, amount of rainfall, degree of weevil infestation, etc. Since some of these factors vary from year to year and can neither be foreseen nor controlled, it would be difficult to apply the laws even if they were known.

It is the consensus of investigators that close planting hastens maturity, at least produces greater yields at first picking; that increasing the width of rows over four feet decreases yields; that increasing the distances in the drill beyond twenty inches decreases yields; that cotton on thin land should be spaced more closely than on rich land.

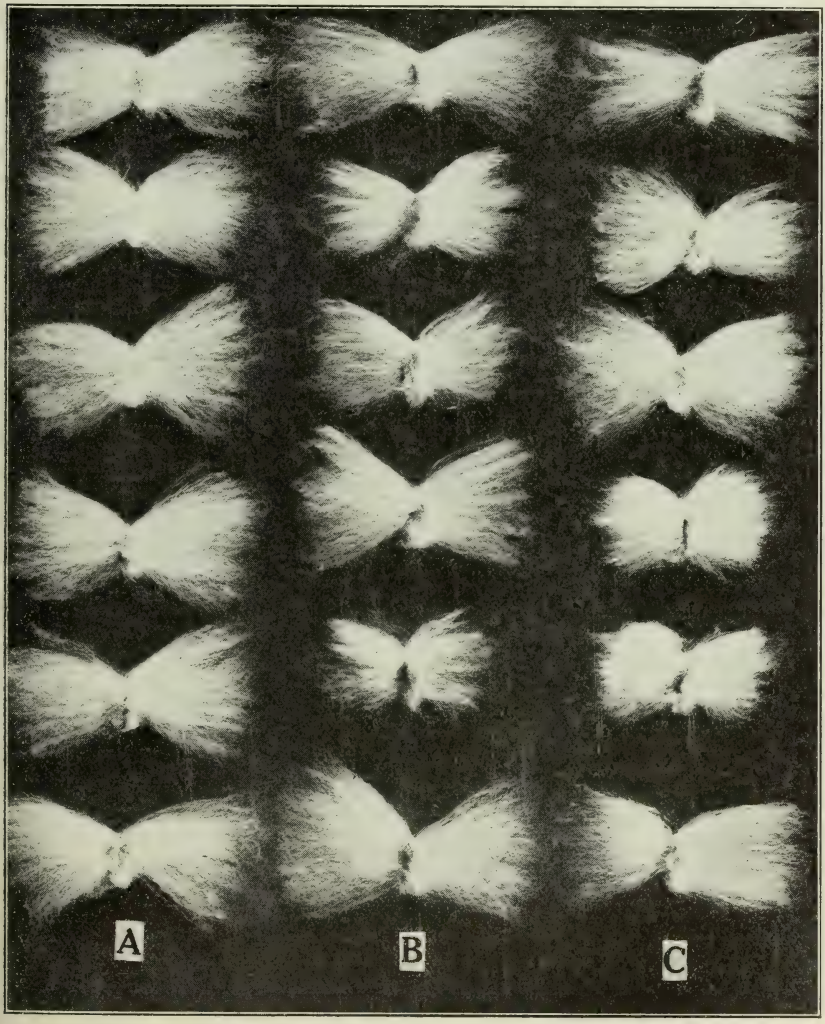


FIG. 1. COTTON SEED WITH LINT ATTACHED.
A. EXPRESS. B. DARDEN. C. TRICE.

What Constitutes a Desirable Variety of Cotton.—The answer to the question, What constitutes a desirable variety of cotton? depends to some extent on the locality. Some varieties are desirable in one locality and not in others. The variety that a planter will grow will be determined by its money value per acre, but this will vary with the season, rainfall, etc.

To be desirable a variety should be early, fairly disease resistant, vigorous in growth, uniform in type, uniform in lint length, storm proof, prolific, and productive of a fair lint percentage and length. It may not be possible to get a variety that measures up to all of these requirements fully, but it must in the main if it is to be satisfactory.

The lint length of many of the commercial varieties being grown at the present time is not uniform. Figure 1 shows the length of lint on six seeds of each of three varieties. These seeds were selected at random. Variety "A" is a pedigreed strain that has been carefully selected. "B" and "C" are impure commercial varieties. In using fiber of irregular lengths like "B" or "C", spinners are sure to suffer considerable loss; and if a part of the fiber will be lost, the spinners are sure to protect themselves by paying a lower price for the cotton.

Warning Against Planting Inferior Varieties of Cotton.—A variety of cotton that has a staple less than seven-eighths inch should not be grown. The United States Department of Agriculture has issued warning against varieties that produce short lint, especially such varieties as are said to be half seed and half lint. The following reasons are given:

"1 Cotton of less than seven-eighths inch staple is of approximately the same spinning value as the bulk of the cotton of India. On economic principles, the American product should be maintained on a higher level of intrinsic worth than that of India in order that the American crop may not be forced to compete in the markets of the world with the cotton of India.

"2 Cotton of less than seven-eighths inch staple is inferior to the average American quality. Localities that produce such cotton in appreciable quantities soon establish reputations for an inferior product. The price of all cotton from such markets will suffer because of the poor reputation of the markets.

"3 Competent buyers discriminate against extremely short staple whenever such cotton is discovered. They should be equally careful to discriminate in favor of cotton of good staple. The farmer who produces inferior cotton is likely to find that his product brings a price materially lower than quotations would indicate as its true value. The seller commonly looks upon such discrimination as a penalty, while the buyer considers that he is paying the full value for an inferior commodity.

"4 Under the common practice of the cotton trade, the price of spot cotton is governed largely by future quotations. In order that future quotations might more accurately reflect the value of spot cotton, Congress, in the United States Cotton Futures Act, provided a form of contract, exempt from the tax imposed by the Act, on which cotton of extremely low grade or which is less than seven-eighths inch in length is not deliverable. This action of Congress was intended primarily for the benefit of producers. One of its results was the adoption by the New York and New Orleans Exchanges of the exempted form of future contract, so that cotton of less than seven-eighths inch in length

of staple cannot be delivered thereon. This legislation in no way affects any sale of spot cotton.

"5 As the variety of seed planted is the primary factor in determining length of staple, and as there are early maturing prolific varieties which produce a staple of at least an inch in length, no farmer or community is justified in planting an inferior variety, or in expecting the full market price for a debased article of commerce."

HOW TO SECURE A GOOD VARIETY OF COTTON.

A good variety of cotton produces plants of uniform type. Types vary with varieties, of course, but within a variety uniformity of type should exist. Figure 2 illustrates a good type for growing under boll weevil conditions. This plant, belonging to the strain Foster-120, is rather low, compact, and not leafy, is fairly prolific, and has large bolls.

Every cotton grower who has seen a pure strain of a good variety planted by the side of a mixture of nameless varieties, need not be told that it pays to plant good seed. Grown under the same conditions, the pure seed may nearly double the yield of the other and also produce cotton of greater value per pound.

FIG. 2. A TYPICAL FOSTER 120 PLANT

A good strain may be developed by almost any planter that is willing to follow the suggestions for cotton breeding given in Bulletin 173*. A start of a desirable strain may be secured from an experiment station or from the Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C. Considerable seed is distributed in small lots, but, unfortunately, a large part of it serves little purpose because the growers do not give the new cotton sufficient isolation. If the small lot of seed is planted some distance from other cotton, separated from it by, say twenty rows of corn, and if sufficient care is taken in ginning, enough pure seed to plant several acres may easily be secured. (See page 38 for discussion of care in ginning seed for planting.)

Experiment stations and professional cotton breeders usually distinguish new strains developed from old varieties by numbers, as Express-350. Growers should pay attention to these numbers and

*Cotton Experiments, 1915.
Bulletin No. 173, Miss. Agr. Expt. Sta., p. 26.

use them in connection with the name. Express-32 is a very different cotton from Express-350. If both are called simply "Express," confusion is apt to result.

Good pure seed may also be secured from certain seed dealers that employ a professional breeder, or that carefully maintain the purity of their varieties. As a rule, seed grown locally will, if properly selected and handled, produce better than varieties brought in from a distance. In all cases, no matter what the source of the seed, a variety will soon deteriorate if measures are not taken to prevent mixing in the field and at the gin.

GIN MIXED COTTON SEED.

Though there are several causes of deterioration of cotton varieties, the chief cause is the mixing of seed of different varieties at the public gin. Ordinarily the seed roll is not removed nor the gin cleaned between different lots or bales of cotton; consequently one lot of seed contains several punds of seed from the preceding lot.

Saunders and Cardon* by an ingenious experiment secured some good data on the amount of seed mixing at a public gin. Their experiment was as follows: "The seed roll which was left in a 70-saw gin after one lot of cotton had been ginned was removed and the seeds stained red with ordinary dye in order to mark them distinctly. They were then thoroughly sun-dried and finally returned to the roll box. The roll was packed as near as possible to the density it had before being removed. When the next bale was ginned, samples of the seed were taken every five minutes from the gin containing the colored roll as the seed dropped into the conveyor. The proportion of red seeds in each sample was then determined. For several minutes after starting only stained seed appeared. After the gin had been running five minutes the sample taken showed 52 per cent colored seed. At the end of the first ten minutes the sample showed 17.1 per cent stained seed (See fig. 3), and after fifteen minutes 7.4 per cent. At the end of twenty minutes 2.8 per cent stained seed appeared in the sample; at the end of twenty-five minutes 0.5 per cent appeared; and the samples taken at the end of thirty minutes showed 0.1 per cent, or one seed in a sample of 801 seeds."

"After the bale was ginned, the roll left in the gin was carefully examined and 32 stained seeds were found. Not until ten minutes after the second bale had been started did these pass out of the gin. No stained seeds were found in the roll box after the ginning of the second bale.

"These results indicate that the exchange of seeds in the roll takes place very rapidly, practically the entire roll being replaced during the ginning of a single bale. Most of the red seed passed out of the roll box during the first few minutes the gin was in operation.

"These results were obtained from only one gin. It is evident that in a battery of four or more gins the chance of mixing seed is greatly increased. However, taking these results as a basis, rather dependable calculations can be made for the purpose of showing in round numbers about how much mixing may occur. Each roll contains from 35 to 40

*Custom Ginning as a Factor in Cotton Seed Deterioration, by D. A. Saunders and P. V. Cardon. Bulletin 288, Bureau of Plant Industry, U. S. Dept. Agr., 1915.

pounds of seed, or slightly more than a bushel. The four rolls in a 4-gin battery, therefore, would contain from 140 to 160 pounds, or from 4 to 5 bushels of seed."

Fig. 3. Sample of cotton seed taken 10 minutes after the ginning of the second bale had begun, showing 17.1 per cent of red seed from the stained roll of the first bale. (After Saunders and Cardon.)

Seed may be mixed also in the pipes or flues that carry the seed cotton to the saws and in the conveyor that carries them from the gin. The amount of mixing that takes place in these places is small in comparison with the mixing in the roll box.

WAYS OF REDUCING SEED MIXING TO A MINIMUM.

By taking a few precautions it is usually possible to prevent seed mixing at the gin. To have his seed ginned properly the farmer should wait until the busy season is over. Then the ginner will have time to take the care necessary in keeping seed pure. The farmer should pay the ginner for the extra trouble. The owner should follow the cotton to the gin and see that the feed pipes are cleaned and that roll box is emptied and cleaned. Seed had best be caught on the floor and not allowed to fall into the conveyor. If the lot of cotton seed is small, it should be fed into the gin by hand rather than by the regular feeder.

The ideal way of preventing mixing of varieties is to grow but one variety in a community. This prevents mixing in the field as well as at the gin.

COTTON STILL A GOOD CROP.

Although the yields made by many of the cotton farmers the past year or two are very discouraging, we do not believe that in most of the northern and central part of the State cotton growing should be abandoned altogether. With the spread of the boll weevil over the rest of the cotton-producing States—they will probably all be covered in two or three more years—the total yield will be less; and since the demand is likely to increase, prices will be good. A good price per pound will give a fair money return from the crop even if a large crop is

not raised. If lands are kept fertile and good cultural methods followed, a fair crop can be produced if the season is at all favorable. In order to keep the soil fertile, live stock must be kept, legumes and other crops grown, and rotation practiced. The other crops will keep labor and teams employed at all seasons of the year if things are properly managed. The most prosperous farms are the farms on which all forces are kept busy.

SOURCE OF SEED.

Below is a list of the sources from which seed of the varieties tested were obtained.

Dodds' Prolific	S. L. Dodds, Hickman, Kentucky.
Trice	Bureau of Plant Industry, Washington, D. C.
Trice-22	College Experiment Station.
Trice-266	College Experiment Station.
Calhoun (Ga.)	N. L. Willet Seed Co., Augusta, Georgia.
Calhoun (Banks)	N. L. Willet Seed Co., Augusta, Georgia.
Wannamaker-Cleveland	Wannamaker and Sons, St. Matthews, S. Carolina.
Cleveland Big Boll	J. R. Cleveland, Decatur, Mississippi.
Cleveland-027-11-24	College Experiment Station.
Cook	J. R. Cook, Ellaville Georgia.
Triumph	A. D. Mebane, Lockhart, Texas.
Miller	T. M. Clark, Verona, Mississippi.
Lone Star	Bureau of Plant Industry, Washington, D. C.
Lone Star-11	College Experiment Station.
Lone Star-15	College Experiment Station.
Lone Star-132	College Experiment Station.
Holdon	Bureau of Plant Industry, Washington, D. C.
Polk	M. L. Neal, Paradise, Mississippi.
Unknown	J. B. Allen, Port Gibson, Mississippi.
Darden	Magee, Dean and Co., Leland, Mississippi.
Columbia (U. S. D. A.)	Bureau of Plant Industry, Washington, D. C.
Columbia (Sherard's)	J. H. Sherard, Sherard, Mississippi.
Columbia **X** Express B-32	College Experiment Station.
Express-122	Delta Experiment Station, Stoneville, Mississippi.
Express-350	College Experiment Station.
Express-32	College Experiment Station.
Express-314	College Experiment Station.
Express-341	College Experiment Station.
Express (Low's)	D. D. Low, Nitta Yuma, Mississippi.
Express (Allen's Big Boll)	J. B. Allen, Port Gibson, Mississippi.
Lone Star **X** Express A-311	College Experiment Station.
Foster-120	Delta Experiment Station, Stoneville, Mississippi.
Sunflower **X** Express A-312	College Experiment Station.
Sunflower (Schaefer's)	Marx Schaefer, Yazoo City, Mississippi.
Panther Burn	J. W. Johnson, Panther Burn, Mississippi.
Hartsville-9	Coker Seed Co., Hartsville, South Carolina.
Webber-49	Coker Seed Co., Hartsville, South Carolina.
Webber-82	Coker Seed Co., Hartsville, South Carolina.
Magruder	T. B. Magruder, Port Gibson, Mississippi.
Gholston	J. D. Gholston, Inverness, Mississippi.
Lone Star **X** Express A-38	College Experiment Station.

Bulletin No. 179 August, 1917

Velvet Beans in Mississippi

By E. B. FERRIS

AN ABUNDANCE OF FORAGE FOR WINTER GRAZING.

After the corn and velvet beans are harvested on the farms of Mississippi, the stalks and vines furnish great quantities of roughage for wintering the stock.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

Velvet Beans in Mississippi

By E. B. FERRIS

Probably no crop has ever received more wide spread recognition or been more generally adopted in so short a time, than has the velvet bean in Mississippi, which within one year has sprung from comparative insignificance to one of the chief crops of the state.

The writer's first experience with this crop, which promises much for the livestock industry and the worn soils of the South, was about the year 1897, when velvet beans were grown on experimental plats at the Mississippi Agricultural and Mechanical College. These first beans made an immense growth of vine but matured few if any seed, and the hay made from them was not only difficult to save but when cured was a very black and undesirable forage. Velvet beans were grown in Florida, however, several years prior to 1897, and were brought to the attention of the Florida experiment station in 1895 by people in the state who had used them for covering trellises and unsightly places about the farm.

As a result of a talk before a farmers' institute audience at McNeill, Mississippi, 1902, by Dr. H. E. Stockbridge, Agriculturist of the Florida Station, who laid much stress on the possibilities of the velvet bean on the lands of South Mississippi, the McNeill Experiment Station began growing these beans and a number of farmers introduced them in a small way. In this latitude, 30 degrees and 49 minutes, we got a good maturity of fruit, and since this introduction the small farmers of this section have used velvet beans very largely as a catch crop in their corn and have wintered their cattle on them almost to the exclusion of other crops.

Until twelve years ago the Florida speckled bean was the only variety grown, and it was not thought advisable to attempt growing it for fruit much above latitude 32 degrees. For this reason the U. S. Department of Agriculture began a systematic search for new varieties, which would be more hardy and which would develop in more northern latitudes. As a result velvet beans have been grown as far north as Pennsylvania where the seed of the 100-day bean ripened in 1916, according to statements from reputable seed houses. Prof. S. M. Tracy of the United States Department of Agriculture now reports that about twenty distinct species of velvet beans have been introduced into this country. With these many hundreds of

hybrids and crosses have been made, developing varieties to meet the demands of almost any condition that may be found in the Southern states. Chief among these varieties are the Florida, the Early Speckled, the Yokohoma, Lyon, Chinese, Osceola, and Georgia. In growing the most of the above named varieties here we have found that the kinds that mature quickest are usually those that make the smallest growth of vine. The Yokohoma, one of the earliest maturing varieties, makes a very small growth of vine, while the Chinese, one of the latest, has made the heaviest growth. Best results are usually had, so far as yields are concerned, by the use of varieties that will continue to fruit up to frost, at the same time having a growing season sufficiently short to mature the bulk of the crop.

VARIETIES.

The Early Speckled—The Early Speckled is the most popular variety of bean so far introduced, and for three or four years in sections where beans are largely grown has been used almost to the exclusion of other varieties. This variety is said to have originated in South Alabama, and is very much like the old Florida bean except that it matures much earlier. It breeds true to type, and, unlike the Osceola, and some other new varieties, shows no disposition to revert to other types. The writer has visited crushing plants in Andalusia, Georgiana, and Greenville, Alabama, and at each place has found that this Early Speckled bean is the only one being used for crushing, the Chinese and Yokohoma having been tried with poor results, and the Osceola, though looked upon with great favor, not having as yet been grown in sufficient quantities to be used for crushing.

The Yokohoma—The Yokohoma is a shy bearer, and makes much less foliage and vine than other varieties; the beans also have a tendency to pop out in the field.

The Chinese—The Chinese is a heavy fruiter, with a long growing season and a very heavy foliage, but the proportion of bean to pod is much smaller than in the Early Speckled. The mills visited were not disposed to want the Yokohoma or Chinese at all, reporting that they were both harder to handle, more difficult to crush, and made a meal of lower feeding value than the Early Speckled. In fact, in those parts of the country visited where velvet beans and corn were being grown more largely than any other crop, not excluding cotton, we found a disposition to exclude all varieties except the Early Speckled and the Osceola, and the latter had been grown so little that, while very promising, its true value had never been determined.

The Osceola—The Osceola bean is a new variety introduced by the Florida Experiment Station, but has several advantages over

the Florida and Early Speckled varieties. It is free from the stinging fuzz or velvet on the pods, which makes the other varieties very unpleasant to handle. It has larger beans and pods, making them less expensive to gather, and also is much earlier, at least than the Florida bean.

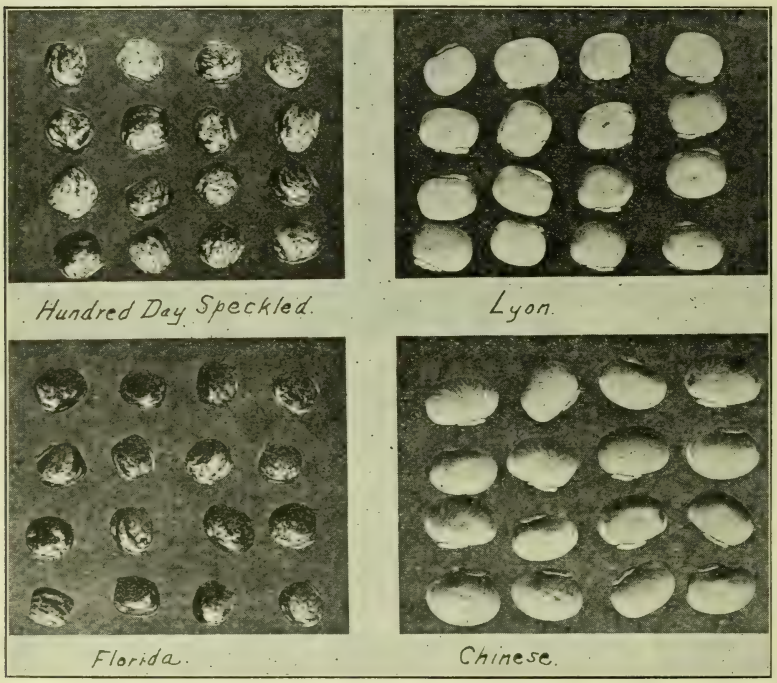


Fig. 1—CHOOSE YOUR VARIETY.
These four varieties together with the Osceola and Yokohoma make up the bulk of Mississippi's million acre velvet bean crop.

At the McNeill station the following varieties of beans were planted April 14, 1916, in alternate rows with corn, and gave yields of dried beans in pods per acre as indicated, the beans having been gathered November 5, and dried until December 12, when they were weighed:

Chinese—4400 pounds an acre.
Yokohoma—850 pounds an acre.
Florida—1870 pounds an acre.
No. 1846D—2380 pounds an acre.
No. 1815C—1530 pounds an acre.
No. 1846C—1190 pounds an acre.
Early Speckled—2040 pounds an acre.

The Chinese beans made the heaviest foliage, and were followed by the others about in the proportion in which they gave seed.

All the seed for these plantings were furnished by Prof. S. M. Tracy, Agronomist, U. S. Department of Agriculture. The land was laid off into rows three feet apart, and alternate rows were planted to corn and velvet beans. The corn rows were fertilized with a mixture of acid phosphate and cottonseed meal at the rate of 300 pounds an acre; the beans, with acid phosphate alone at the rate of 200 pounds an acre.

TIME OF PLANTING.

When velvet beans were first introduced it was necessary to plant them very early in the season to give them time to mature the seed. This is still necessary with varieties like the Chinese and the Florida, but the introduction of quick maturing varieties like the Lyon, the Yokohoma, and the Early Speckled, has made it possible to plant these beans with almost as much latitude as is possible with cowpeas. Since they are always grown with corn, however, and since, other things being equal, it pays to plant corn early, it is usually found best to plant the beans early.

There is much difference of opinion among the large growers of velvet beans as to the best time of planting the beans in the corn, some planting the two crops at the same time, and some planting the corn and waiting several weeks before planting the beans. The concensus of opinion of a large number of growers of velvet beans seems to be, however, that it makes very little difference whether the beans are planted at the same time with the corn or a few weeks later. At the McNeill Station we prefer to plant the beans and corn in alternate rows, and to plant the corn row at least one month ahead of the beans.

Corn may be planted in early March, and will stand a considerable frost, while velvet beans are very sensitive to cold. Besides, if planted a few weeks in advance of the beans, the corn will reach maturity before the bean vines interfere with its development. It is deemed advisable by us, therefore, to plant the corn early in March, when the beans may still be planted in plenty of time to make maximum yields, even though six weeks are allowed to intervene between the time of planting the corn and the beans.

In an experiment conducted here last year we planted corn on the twelfth of April in alternate rows three feet apart. A few days later we began planting Early Speckled beans, in plats of four rows each, or one-tenth of an acre, and continued to plant these beans every two weeks up to July 1.

The yields were as follows, calculated in pounds of dry beans in the pods per acre:

Planted April 15—yield 2,040 pounds.
Planted May 1—yield 1,700 pounds.
Planted May 15—yield 1,530 pounds.
Planted June 1—yield 680 pounds.
Planted June 15—yield 680 pounds.
Planted July 1—yield 510 pounds.

When the last three plantings of beans were made, the corn had reached considerable size, and the shade from it interfered somewhat with the growth of the beans. Too, the later plantings of beans could not be cultivated so well as were the earlier plantings. If the corn and beans had both been planted later, we feel sure that the beans would have made a better showing.

We believe the Early Speckled bean will give fair yields, much better than those given above, if planted here with corn as late as July 1, but corn planted here as late as the 15th of June is often seriously injured by insects, and it is, therefore, much better to plant both crops earlier.

METHODS OF PLANTING.

In order that velvet beans may fruit well, they must be planted with some crop that will support them, or else must be supported with poles like any other running bean. Corn is the crop almost entirely used for this purpose, as it has been found by actual experience that the beans interfere very little with the yield of the corn. On the other hand they always leave large quantities of decaying vegetable matter upon the land, which, in a single season, will largely increase the humus and nitrogen content of the soil, as a consequence making it hold much more water. This improved condition of the soil leads to heavier yields of corn in later years. In talking with planters in South Alabama, where velvet beans have been so largely used to take the place of cotton, it was almost the universal opinion that a crop of beans did not reduce the yield of corn more than ten per cent, if so much; that they were a catch crop almost entirely; and that after gathering from one to two thousand pounds of beans per acre there was still left on the land a large amount of forage and undeveloped beans for cattle and hogs, besides more vegetable matter than could be put on the soil in any other way. While the beans were always planted with corn, different farmers had adopted various ways of doing this; some planting the beans and corn in the same row and at the same time; some, beans and corn in alternate rows at the same time; some, two or more rows of corn to one of beans; and others, the beans after the corn had

come up and been cultivated. A few of the most successful farmers planted alternate rows of corn and beans, with a hill of peanuts between each hill of beans, claiming that the two crops grew well in the same row and in the end made a well balanced ration for hogs.

Fig. 2—ROOM FOR BOTH.

Two rows of corn and a row of velvet beans has been found a good method of planting these two crops in Mississippi. The corn supports the beans but does not exclude the sunlight.

The writer, after fifteen years' experience in growing corn and beans, has come to the conclusion that the most satisfactory method is to plant either alternate rows of corn and beans, or two rows of corn to one of beans, planting the corn as early as possible with the beans a few weeks later, and covering the beans with a cultivator as the corn is worked, or better, using a regular bean planter.

Most of the people in our section plant velvet beans by hand and cover with plow and cultivator, but in sections where they are grown in large quantities the planting is done by machinery. Machines have been devised that will plant corn and velvet beans in the same row at the same time, accurately spacing the two; these planters will drop velvet beans and peanuts in the same way, dropping the regular peanut shelled or the Spanish peanut in the pod. There were two such planters being sold in the places visited, one called Cole Plain View Planter, made by the Cole Manufacturing Company, Charlotte, N. C.; the other called the Waters-Covington Planter, made by the Covington Manufacturing Company, Headland, Ala. The first mentioned planter sells for $16.50; the last named, for $13.50.

To show how extensively people in other states where conditions are much the same as are ours in South Mississippi, are planting velvet beans, I will state that in Andalusia, Alabama, there was one hardware store that had sold two hundred Cole planters during the season preceding the planting of the 1917 crop, and I was told that they had calls for as many more, which the factory could not fill.

FERTILIZERS FOR VELVET BEANS.

Velvet beans will grow on the poorest soils without fertilizer. They have reached their best development in sections of naturally poor soils, and it has usually been found that they do best on sandy soils that have to be fertilized for other crops. While the crop is a legume and gets its nitrogen from the air, it requires some of the mineral elements of plant feed on soils where these are deficient. At McNeill we have found the soils so poor in phosphorus that it is necessary to supply this element in order to get a maximum crop. While it is true that the crop will grow on very poor soils, it will be seen from the results that follow that the velvet bean, too, responds to good treatment, and will, like other crops, give the heaviest yields from applications of animal manures. In 1916 seven plats of land, of one-fourth acre each, that had been used for ten years for conducting permanent tests with fertilizers were planted in alternate rows to corn and velvet beans. Both crops were planted on April 15, the Early Speckled bean being used. These beans were picked and weighed when dry, and gave the following yields, calculated in pounds of the beans in the pods per acre:

200 pounds raw phosphate rock and 200 pounds cottonseed meal, 2,600 pounds of beans.

200 pounds acid phosphate and 200 pounds cottonseed meal, 2,400 pounds of beans.

200 pounds acid phosphate, 200 pounds cottonseed meal and 200 pounds kainit, 2,160 pounds of beans.

12 tons of animal manure and 200 pounds raw phosphate rock, 3,080 pounds of beans.

200 pounds of acid phosphate alone, 2,120 pounds of beans.

200 pounds raw phosphate rock alone, 2,160 pounds of beans.

12 tons of animal manure alone, 2,880 pounds of beans.

In sections around Greenville, Georgiana, and Andalusia, Alabama, the planters were fertilizing the corn, generally putting no fertilizer under the beans. We do not doubt that small applications of phosphate under the beans would pay them. The soils near the places mentioned are naturally much more productive than the soils near McNeill, growing cowpeas well without fertilizer, while at McNeill cowpeas will make nothing without some acid phosphate

at least. In South Mississippi generally we would recommend the use of from one hundred to two hundred pounds of acid phosphate an acre under the beans, results here apparently showing that there is sufficient potash in these soils to meet their present needs.

VELVET BEANS AS A FEED.

For more than ten years the farmers of this section of the state have been using velvet beans for wintering their cattle, letting the cattle run on the ranges as long as they could get feed enough to support them and then turning them on their bean fields. It is the only crop we know that can be left in the field through all kinds of rainy and cold weather without being ruined, the tough pod in which the bean is borne withstanding almost any weather condition and the vines themselves being eaten by cattle with more relish after frost has killed them than before. While the common practice of letting the cattle gather the beans is apparently a very wasteful one, since it would naturally be supposed that they would tramp a lot of the beans in the ground and ruin them, in practice the loss is nothing like so great as it would seem, for if the cattle are followed by hogs, practically every bean will be found and eaten. At McNeill we have even plowed under velvet bean vines, on which a few of the pods had been left, have planted the ground to oats, and later, on grazing the hogs on these oats, have had them smell the buried beans, and in rooting for them almost destroy the stand of oats. The fact is, both cattle and hogs prefer the beans after the pods have been softened by moisture and the beans have swollen, and a great many successful stock men in this country follow the practice of letting cattle and hogs gather all the beans, never picking any of them. In recent years, however, the practice has grown of picking the best of the beans before the cattle are turned in and using these picked beans in the hulls as a feed for cattle or hogs. Both eat them ravenously, the cattle eating pods and beans, the hogs eating the beans and discarding the pods.

Where machinery is available for hulling the beans, it will pay to separate them from the pods where they are to be fed to hogs, and then to use the pods as feed for cattle. These bean hulls have a higher feeding value than cottonseed hulls, and are now selling on the market at fifteen dollars a ton.

A number of feeding tests have been carried on at this station to determine, in rather a rough way, the feeding value of velvet beans as compared with cottonseed meal. When grown purely as a catch crop with corn, so as to interfere as little as possible with the corn, we have found the beans to be worth, for dairy cattle, about ten dollars an acre, as compared with cottonseed meal at twenty-five dollars a ton. The land on which these beans grew was mak-

ing about fifteen hundred pounds of beans and twenty bushels of corn an acre, the corn having been gathered before turning the cows on the beans.

The beans grown at the station in 1916 were nearly all picked and fed in the pods, without grinding or soaking, to dairy cattle. They were fed along with silage, and practically as much milk was obtained from the herd when fed eight pounds of beans in the pod and thirty pounds of silage as when fed four pounds of cottonseed meal and the same amount of silage.

A great advantage that beans have over cottonseed meal as a feed for dairy cattle is that the quantity fed can be increased almost indefinitely without injury to the cow while it is dangerous to feed more than four pounds of cottonseed meal per day to a cow except for a short period. In these feeding tests a number of varieties of velvet beans were used, and while we were not able to tell any difference in the feeding value of the several varieties on account of the rather crude way in which we were compelled to carry on the work, we did find that the Early Speckled bean was the most satisfactory from a physical standpoint, this variety being easier to handle on account of its having a smaller proportion of pods to beans and it being less susceptible to injury from mold, or other causes, than the large podded kinds.

MARKETS FOR BEANS.

While, as has already been stated, the farmers of several of the Southern states have for years been growing velvet beans and marketing them through cattle and hogs, or as seed, up to three years ago, so far as the writer knows, there was not wide market for the beans themselves as a commercial feed crop.

When the boll weevil struck South Alabama about the time that the price of cotton dropped so low following the European war, the merchants and planters of some of the most progressive places began to look for some crop that would in a way take the place of cotton as a money crop, and they decided to try the velvet bean, marketing them not only indirectly through cattle and hogs, but also directly as a feed crop, by grinding them and putting them on the market in competition with other feeds. In getting this work started, these people had the advantage of a rather centralized control of the labor, the farms having been owned in large tracts and to a considerable extent by the supply merchants in the market towns, who were in a way able to so control the labor, or the farmers they supplied, as to force them to do their bidding. In this way, largely as a result of the foresight and energy of a few thinking men, these people began planting beans and corn rather extensively in 1915. They marketed large quantities of beans as seed, for there

was then a heavy demand for them, but they soon found that other markets were needed even that year, and so methods of crushing were looked into. This resulted in the establishment of one or more crushing plants in 1915.

On account of the extremely tough pod, the velvet bean proved a very hard thing to crush or grind. Bur mills would not grind them on account of the rather large percentage of oil they carried, and other kinds of mills that would grind hay or corn in the ear were unequal to the task of grinding the tough podded beans. Then, too, it was difficult to keep the bean meal when ground on account of its becoming rancid, which was found to be due to an excess of moisture left in the beans before grinding. This necessitated drying facilities, which had to be devised. The pioneers in this business had to go through all the trouble also of getting freight rates to the mills on the raw beans and from the mills on the bean meal.

These freight rates have been adjusted to the satisfaction of all concerned, not only within the state but also without the state, and the business of crushing velvet beans is increasing by leaps and bounds. Nearly every town of any size over a wide section in South Alabama and extending into Georgia either has a crushing plant now or is contemplating starting one. Merchants, farmers, and citizens of the town all agree that the velvet bean has saved the day for them, and point with pride to the fact that they have put the country on a cash basis; that the merchants are selling as much now for cash as they ever sold on credit when cotton alone was the money crop; that the lands are being rapidly built up as a result of the beans; and that, while much labor has left the country recently on account of the exodus of negroes to the North, the owners of the land are now able to get more revenue out of it with cattle, hogs and the companion crops, corn and beans, than they were with more labor when cotton was at its best. And the greatest change, after all, has been that the owners of these lands under the new order of things have to do a great deal more thinking and hustling and much less fishing and frolicking than they did when cotton was the one money crop.

MACHINERY FOR GRINDING BEANS.

As has been stated, on account of the hardness and the moisture absorbing qualities of the velvet bean hulls, especially built and very heavy machinery has to be used in grinding them. We found two different machines successfully grinding or, rather, crushing these beans; each could be used also for crushing unhusked corn and various hays. The heaviest of these mills was built by the Williams Patent Crushing and Pulverizing Company, St. Louis, Missouri. There were three sizes in three different plants: No. 0,

with a capacity of fifteen tons in ten hours; No. 1, with a capacity of 30 tons in ten hours; and No. 3, with a proportionately greater capacity. The lightest of these machines sold for $1,250.00; the second size, for about $3,000.00; we did not learn the selling price of the third size. In one plant, a machine, manufactured by the Gruendler Patent Crusher and Pulverizing Company, also of St. Louis was being successfully used. This machine worked on the same principle as the Williams machine but was lighter and sold for less money. Both machines crush the beans by means of a large number of flat hammers that hang loosely on several shafts inside of a cage made from heavy iron in the nature of a screen.

The fineness of the product is governed by the size of holes in the screen, these holes varying in size from one-eighth of an inch to five-eighths of an inch in diameter. The finer the product is ground, the better it sells on the discriminating markets that use it in making mixed feeds. We found one large mill that run its meal through an attrition mill, such as is used for grinding cotton seed cake, after it had been ground in one of the Williams mills as above described.

While some small mills were crushing beans without first drying them, the large crushing plants insisted that it was absolutely necessary to dry the beans before crushing them, and each plant had dry kilns for doing this. These drying kilns were made by the Alabama Machinery and Supply Company, Montgomery, Alabama, and by the B. F. Sturdevant Company, Boston, Massachusetts. In the kilns hot air was used as a means of drying, this air being heated with the exhaust steam from the engines and blown through the kilns by fans. In both kilns the beans were carried through by means of chain belts that travel over a series of shelves, moving the beans in thin layers from three to five times through the dryer, which subjects them to a drying process for about one hour. Drag belts are used entirely in conveying the beans, screw conveyors, such as are used for cottonseed, having proven unsatisfactory. The storage space necessary for handling beans, either at the crusher or by the merchants who buy them, is enormous, and in the towns where they are being bought, both the merchants and the crushing plants are finding it necessary to greatly increase their present storage facilities.

In most of the plants visited we found the boiler capacity necessary to run the mills varying from one hundred to one hundred and twenty-five horse power; with the capacity of the engines about seventy-five horse power. Both boiler and engine power were considerably greater in the larger plants where other work was done at the same time. The investment necessary to buy and equip such plants is in the neighborhood of twenty thousand dollars. In addition to this, money would have to be borrowed through the crushing

season to pay for the beans as they are bought; this, however, can be easily handled through the banks. The mills already in operation in the three towns visited had beans in sight that would keep them busy throughout the year. In this respect it would appear that these mills have a decided advantage over the average cotton seed crushing plant, which frequently does not run more than six months of the year, and necessarily must lose a lot in idle capital as well as in salaries paid to employees, which must go on for the entire year.

Usually the building in which the crushing machinery was installed had been built for other purposes. In one instance an old ware house was used, and in another, a discarded cedar mill where pencil slats had been sawed.

The only house that had been built especially for such work was 100 feet long, 80 feet wide, and 36 feet high, divided into two stories. The old cedar mill was 40 by 160 feet, with two stories, each about 12 feet high, and with a seven foot basement. One of the mills had a storage house 70 by 100 feet, with walls 20 feet high; this was reported not half big enough.

The cost of crushing velvet beans is between one and two dollars a ton; of sacking about two dollars a ton under present conditions, while the net loss in drying and cleaning as the beans go through the kiln amounts to about 250 pounds to the ton. The prices paid the farmers during the past winter varied from $12 to $24 a ton, while the bean meal varied in price from about $25, at the beginning of the season to $35 a ton, f. o. b. factory, at the present time. All mills report an unlimited demand for the meal, which is used largely for feed for cattle in its original state, and in mixed feeds for horses and mules. The market for the meal is by no means confined to the Southern states, as it is fast coming into use by feeders and mixers all over the country. In view of the fact that this meal has been on the market so short a time, it seems remarkable that it has found such an unlimited market at such good prices. This fact alone speaks volumes for its worth, and gives a good insight into the unlimited possibilities for velvet beans in the South. A popular mixed feed for horses is made by the use of velvet bean meal, 50 pounds; alfalfa, 150 pounds; oat straw, 50 pounds; shelled corn, 100 pounds; oats, 50 pounds; all ground, and mixed with 50 pounds of black strap molasses. In other popular mixed feeds, with which fine results have been obtained when fed to horses, velvet beans and pods up to 25 per cent of the mixture are used.

For cattle velvet bean and pod meal should be used the same as cottonseed meal, and should be mixed with other feeds, such as hulls, hay, and silage. Since animals must be educated up to eating it with a relish, it should gradually be made to take the place of the

cottonseed meal. For hogs the shelled beans should be used. If ground, they should be fed as are pure gray shorts, though it is not necessary to grind these beans for hogs. Some of the most successful feeders soak the whole pods for about twenty-four hours and feed in troughs.

The following table gives the analyses of velvet bean feed meal, velvet bean meal, corn meal, wheat shorts, rice polish, and cottonseed meal, in order that they may be easily compared:

	Water	Protein	Fats	Fibre	Ash	Nitrogen Free Extract
Velvet bean feed meal	12.0	18.0	4.0	14.0	4.0	48.0
Shelled velvet bean meal	12.0	23.0	6.5	7.6	3.0	48.0
Corn Meal	15.0	9.2	3.8	1.9	1.4	68.7
Wheat Shorts	11.8	14.9	4.5	7.4	4.6	56.8
Rice Polish	10.0	11.7	7.3	6.3	6.7	58.0
Cottonseed Meal	8.2	42.3	13.1	5.6	7.2	23.6

Fig. 3—VELVET BEANS AS SOIL BUILDERS.
Tons of humus are returned to the soil by a crop of velvet beans.

It should be remembered that the analysis of cottonseed meal given is considerably above that of the meals now placed upon the market, which are nearly always adulterated with cottonseed hulls—frequently to the point where the protein is no higher than that contained in velvet bean meal. When the feeding value of velvet bean meal is compared with that of other high grade feeds, and the prices

at which they are now selling are taken into consideration, there is no wonder that the markets have so greedily taken hold of this commercially new feed.

VELVET BEANS AS A SOIL BUILDER.

As a restorative crop for exhausted soils, velvet beans are superior to cowpeas, soy beans, or peanuts, for they not only make a greater tonnage of vegetable matter but on account of their habits of growth they also leave a heavier percentage of this vegetable matter on the ground to decay and form humus.

The following table, taken from Bulletin No. 60 of the Florida Experiment Station, shows the enormous quantity of dry matter that an acre of these beans will produce, and what an acre of these beans would be worth for nitrogen alone if turned into the soil and the land so cropped as to conserve all of the plant feed:

	Ala.	La.	Fla.
Wt. of green material from acre	19,040 lbs.	22,919 lbs.	21,132 lbs.
Wt. of dried material from acre	8,240 lbs.	7,495 lbs.	5,953 lbs.
Wt. of dried roots from acre	1,258 lbs.	191 lbs.	690 lbs.

	Ala.	La.	Fla.
Wt. of nitrogen in vines from acre	201.3 lbs.	170.0 lbs.	131.5 lbs.
Wt. of nitrogen in roots from acre	12.6 lbs.	2.9 lbs.	9.7 lbs.
Total nitrogen in crop from acre	213.9 lbs.	172.9 lbs.	141.2 lbs.

At the prices for which nitrogen is now selling, an acre of beans such as those given for Alabama, would be worth for nitrogen alone more than fifty dollars not counting the value of the potassium, and humus that they leave on the land.

HARVESTING VELVET BEANS.

On account of its habit of growth the velvet bean makes a very poor hay crop. The vines grow so long and entwine so freely that we do not regard it at all as a hay crop. For the same reason we would not attempt to use it as a silage crop. We know of several high class farmers who grew velvet beans with corn or sorghum and cut the two crops together with corn knives, for use either as silage or dry forage, but it is our opinion that other crops or combinations of crops are better suited to either purpose.

In most instances where cheap labor can be had, it will pay to pick the best of the beans. Even though, with the common varieties usually grown this is an unpleasant task on account of the stinging hairs on the pods, a considerable saving is undoubtedly effected by picking. The price paid for this picking varies from fifteen to thirty cents a hundred pounds; at such prices the labor can

make as good wages as are usually made in picking cotton. Every farmer wants a money crop and is compelled to have one. According to information we have at hand, there is no crop that comes so near to cotton in this respect as does the velvet bean. With the introduction of the crushing plants, which will undoubtedly be built all over the lower South, there should always be a good market for velvet beans, and with increased competition on the part of the trade, the market price ought to increase to the producer.

With cattle and hogs to turn on the bean fields, it is by no means necessary to pick the beans if labor is scarce and high priced, for the animals will get the greater part of them. If both cattle and hogs are being fed to fatten, we doubt that there would be any economy in picking the beans. If, on the other hand, they are being fed only maintenance rations, they will of course, use the feed more economically if the beans are picked and fed in small quantities than if they have free access to the beans in the fields. Large owners of stock ought to be able, with hired help, to grow great quantities of corn and beans for a few months during the early spring; the corn and beans can then be left alone until the corn ripens when it can be harvested and the beans left to be gathered by the livestock at any time during the winter. In this way a maximum quantity of land can be handled with a minimum of labor, for there is nothing to prevent the use of labor saving implements in handling the two crops except when it comes to harvesting, which, on account of the bean vines, must be done by hand.

To show just how the presence or absence of velvet beans in quantity will affect the number and value of the cattle of given communities, we will repeat the record of the New Orleans market as given by one of the commission houses of that city. This record showed that during the three months of January, February and March, of 1917, ninety per cent of the cattle coming to that market were from the velvet bean districts of Alabama and Florida, and that practically all the fat cattle sold there during these three months were from this same terriory. A car of cattle fed on velvet beans at Andalusia, Alabama, sold at New Orleans during this time for $1,950; on the same day a car of cattle from Calcasieu Parish, Louisiana, sold for a little less than $900.00. This difference was due largely to the influence of velvet beans, either directly or indirectly. Another fact showing the influence of velvet beans on the progress of communities in which they are grown is that Andalusia, Alabama, a comparatively small town surrounded by land once cut-over from long leaf pine timber, has a packing plant in which is slaughtered daily five or six hundred hogs. It is the money paid out to the farmers for these hogs, for their velvet beans, and for their cattle which makes the air of prosperity everywhere prevalent in this

town, and enables the merchant to smile and tell you that he is selling more goods now for cash than ever before on credit.

HULLING VELVET BEANS.

In this section of the country very few velvet beans are hulled except for seed; this work is usually done by hand. If the beans are allowed to dry thoroughly, and are then placed in the sun for a few hours, they may be beaten out fairly well with flails, either after placing them on floors or putting them in sacks. One of the best times to hull beans is in the winter when the weather is very cold and the hulls frozen, as at this time the pods are very brittle and separate easily. Two men with flails can beat out ten bushels a day.

Except in the case of the individual small farmer who wants seed or a few beans to feed, one cannot afford to depend on hand methods of hulling. Where the beans were grown in quantity, we found a number of machines for hulling them being used successfully. A Case thresher with a regular bean cylinder and a No. 18 separator, pulled by a twelve horse power engine, will thresh eight hundred to one thousand bushels a day. We saw also a number of machines sold by the International Harvester Company, known as the New Racine, Junior and Senior, threshing beans successfully; the smaller machine can be run by an eight horse power engine. Both makes of this machine would thresh oats, pick peanuts, or shell corn.

A machine very highly recommended by large handlers of beans is made by the Coger Manufacturing Company, Morristown, Tennessee. This will shell sixty or seventy bushels of beans an hour, is run by a ten horse power engine, and sells for about $350. A much cheaper machine than the ones above mentioned may be used for hulling beans, the Star Pea Huller, which costs about $65, and can be run by a two horse power engine.

This machine is made by the Star Pea Huller Manufacturing Company, Memphis, Tennessee, and would doubtless meet the demands of a number of small plants to be scattered widely over the country where velvet beans would be hulled for toll or for a fixed money charge. At Georgiana, Alabama, there was such a mill that made a business of grinding beans in the pod, corn in the husk, shelled corn, hay or any other forage; also of hulling velvet beans, and of grinding the shelled beans. This plant consists of a building one story high, 36 by 70 feet, in which is installed a No. 0 Williams feed and bean crusher, costing $1,250, with a capacity of 15 tons a day; a Star pea huller, No. 12, costing $65, and having a capacity of shelling forty bushels an hour, a 35 horse power engine and 50 horse power boiler placed in a shed room at the end of the main building. Mr. Weathers grinds for the public,

charging one-sixth, or twenty-five cents per 100 pounds, for crushing beans; twenty-five cents a bushel for hulling beans; and the customary prices for other work. He also buys beans and crushes them for the market. He has no dryer, thinking the drying process not absolutely necessary though it would facilitate the grinding considerably. This opinion is at variance with the opinions of the larger mill owners by whom it is thought that drying is absolutely imperative. Eliminating the process of drying does seem to reduce the cost of crushing considerably, the cost being in the neighborhood of a dollar a ton when the beans are not artificially dried. One hundred pounds of beans in the pods will give an average of sixty pounds of shelled beans and forty pounds of hulls, these hulls having about ten per cent of their weight in poorly matured beans that will not hull, which adds greatly to their feeding value. Such hulls were selling for fifteen dollars a ton when the bean feed was being sold at thirty-five.

QUANTITY OF SEED TO PLANT AN ACRE.

The cost of seeding velvet beans is perhaps the lowest of any other market crop, the amount of seed necessary varying with the variety used; the larger the bean itself, the greater the amount of seed necessary to plant a given area. One peck of beans like the Chinese, Osceola, and Lyon will plant an acre; less than half a peck of the Early Speckled or Florida Speckled will do the same under average conditions. This makes the cost of seeding with home-raised seed almost negligible. To illustrate how quickly these velvet beans multiply themselves, we will relate a fact told us by a large supply merchant at Andalusia, Alabama. Three years ago this merchant got a few of the Early Speckled beans when they were first introduced. He gave a peck of these seed to a friend, who planted them, and from the beans grown sold the following winter $437 worth of seed, at the rate of $4 a bushel, saving twelve bushels for home use. The man to whom these seed were given plants one row of corn and one row of ground peas, puts the velvet beans two feet apart in the peanut row, and uses the beans he does not gather and all the peanuts to fatten cattle and hogs in the fall and winter.

PREPARATION OF LAND AND CULTIVATION.

On well drained land such as is usually planted to velvet beans the ground should be flat broken as for corn, well disced and smoothed, and then laid off into rows three to four feet apart as preferred. As stated, we prefer at McNeill to have the rows three feet apart if alternate rows are to be planted to corn and beans, or three and one-half feet apart if two rows of corn are to be used to one of beans. In the event of planting corn and beans in every row

we believe these rows should be four to four and one-half feet apart. This laying off is done with an ordinary Georgia stock with scooter point, and, even where planters are used, this will be found satisfactory. When beans are dropped by hand in the furrows they are usually covered with cultivators as the corn is worked or covered, as the case may be; when planters are used the beans are covered by plows attached to the planters. When seed are fresh they nearly always come up to a good stand; under no circumstances, however, would we use seed more than a year old, as germination in such seed will be practically nothing.

Good stands of velvet beans are much more easily had than of soy beans or cowpeas, as they send up a strong plant that can push through almost any crust, which cannot be said of the other two crops.

Cultivation may be done with any ordinary cultivator, sweep, or harrow, and does not differ in any particular from that given cotton or corn, with the exception that harrowing with smoothing harrows after the plants are up, as is so often done with corn, is not recommended, never having been tried here with beans.

CONCLUSION.

After fifteen years' experience on the cut-over lands of South Mississippi—and these lands are representative of millions of acres of land in other Southern States—the writer believes that cattle and hogs with corn and velvet beans will come nearer solving the problem of profitable agriculture for the section as a whole than all other things combined. From this statement it is not intended, however, that inference shall be made that there is not great value in many other crops for field cultivation or for pasture.

As a matter of fact a great many other crops that grow well on such soils, such as oats, peas, soy beans, peanuts, sorghum, lespedeza, and some of the clovers will greatly add to the possibilities of the two major crops, but with the exception of lespedeza for meadows and pasture, we believe the acreage devoted to corn and beans should generally equal that of all the others combined under average conditions. With corn and beans to furnish concentrates and some roughage, lespedeza for hay, and other crops mentioned as supplementary thereto, there is no reason why the small two-horse farmer, who now and always will do the most of the actual work of developing these lands, may not so increase his income as to be able to live in a way that others, seeing his good work, may be willing to do likewise, and in the end develop at least a part of the millions of acres of our idle lands.

Bulletin No. 180 August, 1917

Pasture and Forage Crops For South Mississippi

By E. B. FERRIS

AN ABUNDANCE OF FEED.
Raising feed first, livestock next, is the principle now advocated for turning South Mississippi into a prosperous farming section.

Mississippi Agricultural Experiment Station.
Agricultural College, Mississippi.

SUMMARY

As for the rest of the South, Bermuda grass is without doubt the best of pasture grasses and is recommended as the basis for all permanent pastures and to prevent soil erosion..... Page 7

The fact that lespedeza is a legume, that it grows without petting on the lands of South Mississippi, all of which are naturally deficient in nitrogen, that it is adapted both as a pasture and hay crop and that hay from it ripens in the fall when weather conditions are generally favorable to saving it, makes it a crop that will probably mean more to the upbuilding of the section than any other in the whole catagory of farm crops. . Page 9

Red Rust Proof oats sown in the early fall on land of average fertility make the most reliable of all winter grazing crops for South Mississippi, and the sandy nature of our soils makes it possible to graze these oats without injury to the land for the greater part of the winter. Experience with dairy cows has shown that not even the best silage will compare with oats in increasing the flow of milk..... Page 10

On land that has been built up with animal manures and inoculated with the proper germ life, bur clover and Bermuda grass make, perhaps the best pasture combinations that can be grown in South Mississippi. A single seeding or planting of either will last indefinitely..... Page 12

Land on which crimson clover is to be grown should be thoroughly inoculated with the germ life peculiar to the crop and should by all means have at least a part of the plant food given it furnished by animal manures..... Page 13

Alfalfa has not been successfully grown in South Mississippi, due to unfavorable soil and to the destructive effect of crab grasses. ..... Page 14

Sudan grass, with the exception of lespedeza, which it far exceeds in tonnage, has been found to be the best hay crop that has been tried in South Mississippi. ..... Page 16

Silos make it possible to save the entire crop of corn as a palatable feed, and are one of the best assets to the livestock man. Yields of silage are made from Texas seeded ribbon cane and early amber sorghum. ..... Page 17

For the small farmer the velvet bean is the most valuable of all the leguminous forage crops. Soy beans, which are almost as rich in fats and proteins as cottonseed meal, have been found to grow well in South Mississippi. ..... Pages 23 and 27

Pasturage and Forage Crops For South Mississippi.

By E. B. Ferris.

South Mississippi with its low priced land, favorable climate and long growing season is rapidly coming to be looked upon as a new land of opportunity, and requests for information as to conditions here are constantly increasing.

To furnish the desired information for the benefit of new comers or prospective settlers, many of whom have purchased or contemplate buying the cheap land left by the saw mill men, as well as to help the farmers already established here to greater success, the McNeill branch experiment station has conducted an investigation as to the best crops for pastures and forage purposes. These crops are of first importance in the development of livestock farming here as elsewhere. The conclusions drawn in this investigation are based on years of observation of actual farm conditions, on the results of original research carried on by the McNeill Station for the past fifteen years and on a comparison of the work done in grasses here with the work of other stations.

For some years the author lived in several parts of Mississippi, other than the southeast section. For a time also he lived in Alabama. During the last fifteen years he has had experience with the cut-over lands of South Mississippi. Familiar with conditions in this part of the state and with conditions elsewhere in the South, he is able to compare them with a fair degree of discrimination.

South Mississippi is bound to develop largely as a stock country. Experience in cultivating these lands for fifteen years in almost every known crop has proved to us that only with livestock can the average farmer make a living and keep up the productiveness of his land. Besides this there is so much idle land in the country that even under the most favorable circumstances it will be years before this land can be utilized except as grazing ground for some kind of livestock. The ranges of this section, almost unlimited, furnish fair grazing for sheep and cattle for about seven or eight months of the year.

As a rule, however, the owners of livestock have depended too largely on such ranges for feed throughout the year; with the result that the animals have lost in winter a large part of the gains made in summer. Stock raising has consequently been somewhat slow in developing. The farmers have, however, a fine opportunity to utilize these ranges the year round; in summer they may graze the cattle; in winter they may fatten the stock for market on the crops grown on the better lands. All the while the stock will be retaining manure to the land.

South Mississippi was once known as a cow and sheep country. Then under a system of utilizing the ranges and saving the manure from the cattle by penning them at night, the owners of these cattle were able to make good crops on limited areas even without the use of commercial fertilizers. In those earlier days the winter ranges were better than they are now, and many of these cattle went through the winters without being fed; but at present the ranges have been burned over so much that nearly all the switch cane which formerly furnished the winter grazing has been killed, and cattle must now be fed in winter in order to make a fair growth, and frequently in order to live at all.

At best, however, the native grass on these ranges is very poor, and can be depended on at all only because the acreage per cow is almost unlimited. When the land is fenced and the animals are confined, it requires at least five acres to support a cow, and more than five acres, if bushes and weeds are allowed to occupy any considerable portion of the land, as they will do unless special precautions are taken to get rid of them.

Many of the best pasture crops do not thrive as they should on the wild lands until the lands have been plowed and sweetened, at least to a limited extent. To plow and mow these lands with stumps still on them is almost out of the question. Though at one time we advocated the use of stump land for pasture, we are now of the opinion that it is almost as essential to get rid of the stumps on pasture lands as on lands to be devoted to field cultivation, particularly if we are to expect them to support anything like a reasonable number of animals to the farm.

Every livestock man appreciates the importance of good pastures in raising animals of any description, and knows that it is only where we have good pastures that

we can hope to make a profit. It is the writer's experience and observation that the men in this state who have made money out of cattle are largely those who bought in the spring and sold in the fall, utilizing such pastures as they had; and that the success of these men was largely determined by the amount of good grass their pastures produced.

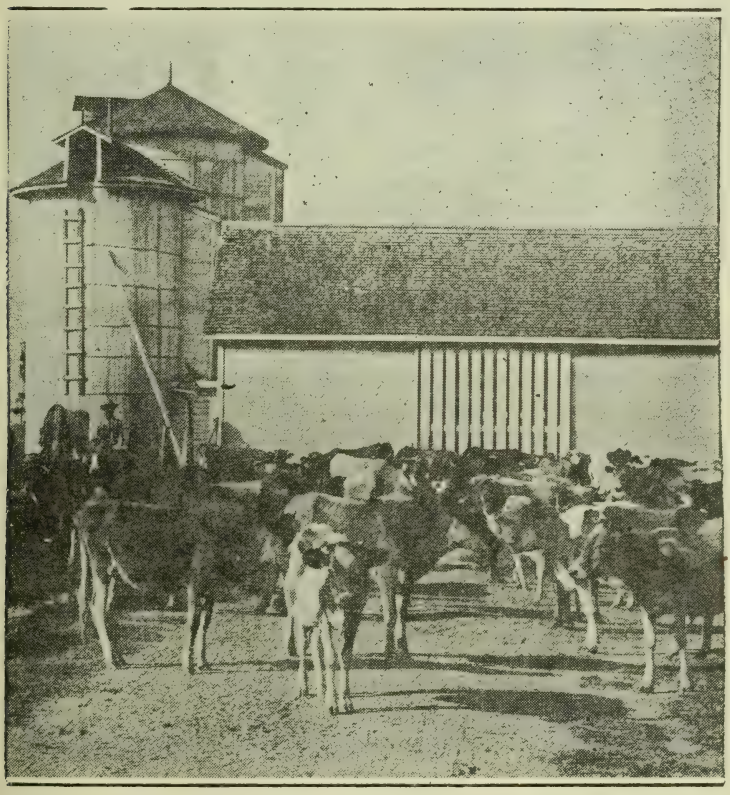


Fig. 1. DAIRYING, A PROFITABLE TYPE OF FARMING. The necessity of building up the soils makes some form of livestock farming essential to the advancement of South Mississippi.

The best pastures cannot be made in a single season, even where we have first class land to start with, as it is a gradual process, just as much so as to build up the soils that make the record yields of corn or cotton. The best

pastures contain many different plants, a dozen or more species being frequently found in the course of the year in the same pasture. Needless to say, these varieties should all be plants that are relished by animals and not a variety of weeds that the animals will not eat.

Failure to appreciate the importance of pastures has been the cause of much dissatisfaction to many who have started in the business of growing livestock in this section. A good many of the large land owners in South Mississippi have in the past four years tried to help the country and themselves by going largely into the growing of beef cattle. They have had a keen appreciation of the benefits of good blood and of the harmfulness of the cattle tick, and have generally seen to the buying of the best bulls and to the extermination of the ticks on their pastures; but many have failed to make it profitable, almost altogether on account of a lack of adequate pastures.

Under the conditions existing in this section it would probably pay the prospective livestock man who has not already improved lands for pasture, to postpone the buying of livestock, especially cattle, for at least two years, and to devote the time to improving the land on which he hopes to pasture them. We have gone on the wrong assumption in thinking that the first thing necessary in going into the livestock business is to buy the stock. The first thing to do, if we hope to make a success, is to provide pastures and feed, always remembering that it is far better to have too much rather than too little of either.

The same principles apply in making good pastures as in growing good crops of any other description. To build up the soils in Southeast Mississippi into good pasture lands they must be fertilized well, especially with nitrogen and phosphorus. Animal manures furnish the best source of either of these elements. So far, however, there has never been enough manure produced in this section to fertilize more than one per cent of the lands. In the absence of this manure we will be compelled to depend either on commercial fertilizers or on leguminous crops and raw phosphate rock. Commercial fertilizer will pay as well with pasture crops as with any other kind, provided we have the best animals to consume these crops. In making good pastures, we have on account of the sandy nature of the soil found deep plowing unnecessary: and we have also found that raw phosphate rock

furnishes the cheapest source of phosphorus and that the droppings from the cattle, and the legumes which may be grown here, of which lespedeza is decidedly the best, may be depended upon to furnish the nitrogen necessary for good pastures. It would be a pleasure to give the names of some new pasture crops that would revolutionize the pasture prospects of the country; but experience with a great number of them tested here shows that we can best depend, at least for the present, on such every day crops as Bermuda grass, carpet grass, and lespedeza for summer and on oats, rape, bur clover, hop clover, and perhaps crimson clover for winter and early spring. In order to get profitable results from these, we must grow them on land that in fertility is much above the average range land. With pasture, as with other crops here and elsewhere, good land as compared with poor land will make the difference between success and failure.

BERMUDA GRASS.

Bermuda grass grows well on all the land here that has been brought into cultivation and fertilized even to a limited extent. It failed, however, to make any better pasture than the native grasses when planted on the ranges without fertilizer. It is without doubt the best of the pasture grasses, not only for South Mississippi, but for the entire South; and we use it here as the basis of all permanent pastures. A great many people hesitate about planting Bermuda grass on their places because when once started it is, as a rule, difficult to get rid of. The sandy nature of the soils here makes it possible to plow up Bermuda sod with no great effort. The grass so effectively prevents soil erosion and gives such good grazing at the times we are able to turn stock on it, that we prefer to have all land, even that land devoted to the growth of regular farm crops, sodded more or less to this grass. This grass will sooner or later spread over any farm in the localities of this station on which it may be started, as it makes enough seed this far south to ensure this. When plowed up in the winter or early spring, Bermuda grass may easily be killed down to where it interferes but little with such crops as may be started early in the year and will attain their growth near midsummer. For instance, on a piece of land at this station the grass was plowed under and the land planted in corn. By the

middle of August seventy bushels to the acre were removed. The cultivation of the corn and the shade cast by the corn did not kill all the grass roots, and after the corn had been removed the small patches of grass spread rapidly. By the first of October a complete sod covered the land. This growth furnished good grazing from the first of October until killed by frost after the middle of November, a season when pastures are generally poor. Regular Bermuda pasture at this station may be plowed up in the fall and planted to oats, the latter giving good grazing during the winter and early spring and the Bermuda regaining the use of the land when the oats are gone. This combination can be worked here on any land of even medium fertility that has the grass started on it; and if there is no grass on it, it is a simple matter to get it started by throwing bunches of the grass ahead of the plow as the land is being prepared for the oats. We have had fine success at McNeill and at Laurel in getting stands of Bermuda grass by sowing in the spring a few pounds of seed to the acre over land that has been broken, even rough woods land only sufficiently cleared to get a scooter plow through it to break it up in patches here and there, being sufficiently sodded the first year to make a good pasture after midsummer. At McNeill we get rough woods land thoroughly sodded the first summer by sowing in the early spring only two pounds of Bermuda grass seed mixed with one hundred pounds of cottonseed meal to the acre. Under average conditions it is cheaper and more satisfactory to get Bermuda started by using the sod which may be taken up either with a shovel or by means of a turn plow. This sod dropped a few feet apart over land that has been broken will soon spread over the entire land; the richer the land, the quicker it will cover it.

CARPET GRASS.

Carpet grass will grow better than Bermuda on the range lands. It grows naturally along every cow trail through the country, thriving best where it is trampled. It is better adapted to the country than is Bermuda, and we have noticed that it will supplant Bermuda if the latter is grazed heavily and it not plowed up occasionally, say once in three or four years. Carpet grass does fairly well even on the ranges, and if weeds and bushes are kept

down, will give fairly good grazing even on the natural soil though it will, of course, furnish more grazing of decidedly better quality if the land is fertilized. Carpet grass, like Bermuda, roots at every joint and may be introduced into new fields by planting the sod as recommended for Bermuda or by sowing the seed. Unlike Bermuda, it never becomes a pest. It is easy to eradicate when the land on which it grows is brought into cultivation. This grass spreads naturally, being found over practically all the pastures at this station though we have never sown a seed or planted a sprig of it. It is the grass usually found around every town where the cattle gather and pack the soil, and is eaten with great relish by all kinds of livestock.

LESPEDEZA.

This legume has not generally been introduced into this part of the long leaf pine belt. Many of the native people do not know it when they see it. When the lands here, however, have been given some phosphorus, either acid phosphate or raw phosphate rock, lespedeza is about as well adapted to our conditions as it is to those of southwest Mississippi and Louisiana, where it is as well known to the people as crab grass and where it is not only their most valuable pasture crop but perhaps the best hay crop as well. It grows luxuriantly in many of the old fields of this section which have been left out of cultivation. From seed sown on oat sod last spring, two tons to the acre of the best quality of lespedeza hay was harvested this fall. On the range it amounts to little as a pasture crop, and even in the pastures, except where they have been plowed and fertilized, has never grown to any extent. The absence of lespedeza on the ranges may be due to the forest fires that sweep over the country almost every year. Lespedeza does not, however, thrive so well on the turf land as on lands that have been plowed one or more times. When grown at the station this year on land that had been fertilized with raw phosphate rock, it attained a height of nine or ten inches, made more than a ton of hay to the acre, and had a vigorous healthly color. Bermuda grass on the same land reached a height of only a few inches, was not tall enough to cut, and had a pale sickly appearance from the want of nitrogen, showing conclusively the lack of this element in these soils and the

power of lespedeza, a legume, to get what it needed from the air. The fact that lespedeza is a legume, that it grows without petting on the lands of this section, all of which are naturally deficient in nitrogen, that it is adapted both as a pasture and hay crop and that hay from it ripens in the fall when weather conditions are generally favorable to saving it, makes it, in our opinion, a crop that will mean more to the upbuilding of the section than any other in the whole category of farm crops.

A good deal of the lespedeza, growing now on the station land, was introduced naturally, but this is largely in pastures that have once been in cultivation. It does not grow on the native grass lands, even though these are kept free of weeds and bushes. Lespedeza grows well in combination with either Bermuda or carpet grass and makes an ideal companion crop for oats. It may be planted on oat sod in the spring. After the oats are cut, it will occupy the land through the summer and fall. If the seed are allowed to mature, the grass may be cut and saved for hay, enough seed shattering from it in the process of saving the hay to reseed the land. After the lespedeza is saved, oats may again be sown and lightly disced in, or put in with a drill after the land has been disced. By this method, we have made our best yields of oats which have been followed by lespedeza making two tons to the acre.

OATS.

Red Rust Proof oats sown in the early fall on land of average fertility make the most reliable of all winter grazing crops at the McNeill Station, and the sandy nature of our soils makes it possible to graze these oats without injury to the land for the greater part of the winter. Experience at this station with dairy cows has shown that not even the best silage will compare with oats in increasing the flow of milk, and that these oats may be grazed all the winter and still make a fair crop of grain or forage if the cattle are removed by the first of March. Even reasonable grazing does, however, reduce considerably the yield of grain and straw. Tests show that where oats were grazed up to the middle of February they were reduced from an average of thirty-six bushels to the acre to twenty-four bushels with a proportionate reduction of straw.

We can recommend for this section only those varieties of oats that are relatively rust resistant. The turf oat that makes such a valuable grazing crop for other sections is almost worthless here on account of rust. This oat has been planted here repeatedly and has never matured as many seed as were planted, having been destroyed by rust. Oats not only make our most reliable winter grazing crop but also one of our best grain crops. In 1915 we harvested fifteen acres of oats that had been grazed considerably during the winter and averaged from them forty bushels to the acre of grain, and used the straw, which was housed, as roughage for dairy and beef cattle. This was consumed by them with very little waste. Success with oats will depend very largely on the time of planting. The average farmer waits entirely too late to get them in, and as a consequence they are apt to fail from several causes. Oats planted late sometimes, are killed by winter; at other times, they do not tiller as they should, and, maturing late, suffer more from fungous diseases than oats planted even a few days earlier. Rust, the great enemy here to crops of this kind, is much more active in warm, than in cold weather. As a consequence rye and wheat, which do nicely during the winter, are quickly destroyed by rust with the approach of summer so that neither crop can be recommended. As stated in another paragraph, we consider a combination of oats and lespedeza an ideal one for this section not only for pasture and forage purposes, but for keeping up the fertility of the land as well. Another advantage of oats over all other winter pasture or forage crops is the ease and cheapness with which they may be planted. Two bushels to the acre make a good seeding and should cost not over one dollar and fifty cents. The cost of fertilizing and preparing the land is less than with any of the other winter cover crops, and the chances of getting good stands are infinitely better than with rape, vetch or any of the clovers.

RAPE.

The next most reliable winter cover crop for this country is Dwarf Essex Rape. It belongs to the cabbage family and, like all the other members of this family, requires rich land in order to do even reasonably well. Except for this and the fact that it is harder to get a stand

of rape than of oats under adverse weather conditions, we would consider the two crops equally reliable for winter grazing. On lands near the barns that have been built up from the droppings of dairy cows, we have been growing rape every winter for eight years and have never failed to get good yields though we occasionally have had to plant as many as three times on account of dry weather. This rape has been used for dairy cows. Tests have been made several times to determine its feeding value, which has been found to be about fifteen dollars an acre, ten dollars for the first cropping and half as much for the second. It has been found here to be one of the best of the winter crops for poultry, almost insuring a heavy production of eggs in winter.

BUR CLOVER.

On land that has been built up with animal manures and inoculated with the germ life peculiar to bur clover this clover and Bermuda grass make, perhaps, the best pasture combination that can be grown here. A single seeding or planting of either will last indefinitely since the clover reseeds itself each spring, the seed lying dormant on the land and germinating in the fall. The extremely wet summers, however, cause many of the seed to sprout too early and be killed by the hot sun. The crop is, therefore, suited hardly so well to this part of the state as to the more northern sections where the summers are drier. A combination of bur clover and Bermuda, on two acres of land near the dairy barn, that was too rolling to cultivate, has for four years given us almost continuous grazing and doubtless has produced more feed than any other plat of land of twice its size in South Mississippi. We do not, however, hold out the hope that any considerable amount of land could be handled in these crops, at least not until the country as a whole goes more largely into livestick and has more manure, for we have had considerable difficulty in getting the bur clover to grow well on several other plats of land here not so highly built up from the droppings of cattle. We have had better success planting the cleaned seed than those in the bur, even though we boiled the burs according to rule.

CRIMSON CLOVER.

Crimson clover is generally considered the best of all the winter legume cover crops for lands of the nature

of those of South Mississippi. On similar soils of the states east of us crimson clover has for years been grown in large quantities. On the best lands here, those that have been built up with animal manures, we have generally grown good crops of crimson clover, but on average soils the crop has done poorly and we could not recommend it as one to be grown for profit. Nearly all leguminous plants are benefitted by applications of lime. In preparing land for crimson clover, alfalfa or most any of the other clovers, it is well to use a ton or more of lime; Heretofore it has been impossible to use lime in any quan-

Fig. 2. AN ABUNDANT COVER CROP OF CRIMSON CLOVER. Crimson Clover is generally considered the best of all the winter legume clover crops for lands of the nature of those of South Mississippi.

tity over the greater part of South Mississippi because of the high cost. The state will now, however, supply lime to the farmers at the actual cost of crushing the rock; and the railroads will be compelled to haul the ground limestone at a very low rate, making the cost probably about $1.50 a ton. When lime can be had at a nominal cost, the

growing of all clovers ought to be much easier than in the past.

Land on which crimson clover is to be grown should be thoroughly inoculated with the germ life peculiar to the crop and should by all means have at least a part of the plant food given it furnished by animal manure. This manure not only supplies the needed plant food in the best form, but also serves as a medium for the spread of the bacteria that must be present in the soil before any crops of this nature will thrive. The best means of getting this inoculation is by spreading over the land soil from a field where the clover has grown, but in the absence of this we have had fair success here with the use of prepared cultures sold by most of the seed houses. We have found crimson clover especially suited to growing in orange orchards as a winter cover crop to be grazed off by hogs, to be followed in spring by soy beans which may be used for the same purpose. Hogs graze both crops well and do no injury to the oranges, even refusing to eat the ripe fruit when it falls before them.

ALFALFA.

Repeated efforts have been made here to grow alfalfa and at times we have almost been persuaded that it might be done successfully, only to be disappointed at the end of the year by having crab grass destroy the stand. We have even planted it in drills and have kept the grass down with hoes, but the alfalfa would in the end disappear. We believe we are safe in advising that the average man confine his efforts to growing crops better suited to the country; and that if an attempt is made to grow this crop, it be done on only a small scale and then only on the best land especially prepared, limed, manured and inoculated.

VETCH.

Several varieties of vetch have been grown here repeatedly, and all of them have done well for a single season. The only trouble is that they have failed to reseed themselves with any degree of certainty, and the seed are too expensive to be bought every year. The crop, while an annual, should reseed in the spring, as does bur clover, and the seed should lie dormant through the summer and germinate in the fall. For several years here vetch has

reseeded itself fairly well and good stands have been obtained from seed that had been left from a previous crop; but on the whole all the vetches have proved unreliable, and we can only recommend that they be grown in an experimental way.

HOP CLOVERS.

At least two varieties of the true clovers, known as the hop clovers, grow wild in certain parts of the pine belt and in many places may be seen growing along the road sides. They are usually too small to use as hay crops, but are good grazing clovers and valuable as soil builders. The seed of these clovers are not sold regularly on the market, but they have so much merit that they ought to be planted as much as possible. Any legume that will grow in winter and early spring on the natural soils of this country deserve to be given better recognition than these clovers have had in the past. The writer has seen these clovers growing in great quantities in Laurel near the barns of the Eastman-Gardiner Lumber Company where the seed were doubtless spread from hays used for feeding livestock.

MEXICAN CLOVER.

Mexican clover is not a true clover, but belongs to the same family as poverty weed. It is called clover because its habit of growth is very similar to that of red clover. It grows here abundantly in cultivated fields, and a heavy crop of it nearly always follows corn that has been planted early, leaving the land unshaded for the development of the clover in late summer and fall. It has never been planted here at the station, but invariably comes up after corn unless velvet beans, grown with this corn, completely shade the land until frost. The crop furnishes fair grazing for cattle between the time of gathering the corn and the first freeze; and it is frequently used as a hay crop, giving a good tonnage of a fair quality of hay that is much used by the farmers of this section. Even when this clover has been killed by frost, cattle eat it in the fields with a relish. So far as we know the seed are not regularly sold on the market, but they may be gathered from wagons in which the hay is hauled or from lofts in which it is stored.

BEGGAR WEED.

Beggar weed is a legume which grows well here without the artificial inoculation necessary for the clovers and alfalfa. It is erect in its habit of growth and frequently attains a height of seven feet. When it grows to this height, however, is has large woody stems and branches. It makes a heavy growth of hay that is apt to be unusually coarse unless grown very thick on the land. We have not been able to depend upon it here as a volunteer cover crop as farmers are said to do in Florida; but where the seed can be saved at home, which is possible at a small cost per pound, the land may be seeded at a cost of not less than two dollars an acre. There are many times when a crop of beggar weed may be grown after other crops and be worth fifteen dollars an acre as feed or fertilizer.

SUDAN GRASS.

This grass was introduced into the United States only within recent years, but its growth has extended rapidly over the country. It his been grown here a number of times. With the exception of lespedeza, which it far exceeds in tonnage, it is the best hay crop that has been tried here. It has been planted in drills three feet apart about the middle of May after a crop of cabbage and has given two good cuttings of hay—on July 1 and September 1—that combined were at the rate of four tons of cured hay to the acre, and another cutting about frost, which though badly damaged by a fungous growth similar to rust, was worth something. The quality of the hay is very much the same as that of Johnson grass. The two grasses, in fact, are quite similar except that the Sudan grass does not have the under ground stems that characterize Johnson grass and make it so hard to exterminate. Sudan grass was used here this year for silage on account of ripening when the weather was unfavorable for saving it for hay. It makes a silage of much the same quality as sorghum. The seed of this grass have heretofore been very high because of the fact that it has been so recently introduced, but they will be plentiful hereafter and will doubtless not sell again for more than ten cents a pound. Four or five pounds will seed an acre if planted in drills.

ENSILAGE.

The section as far south as McNeill has a climate unfavorable to saving dry forage of any kind; the exceedingly heavy rains, which come as a rule when most of the hay crops are ready to save, are disadvantageous. Oats, however, will usually ripen before the summer rains set in, and lespedeza will be ready to cut for hay after they are over. Crops that have to be harvested between the first of June and the first of October are made into dry forage with great uncertainty on account of frequent showers and a damp atmosphere. Some method of saving forage, that is independent of weather conditions, is very essential to success. The annual rainfall at McNeill averages nearly seventy inches, and the fall has gone

Fig. 3. SILOS ON A SOUTH MISSISSIPPI FARM.

Weather conditions make silos in South Mississippi doubly valuable as storage houses for crops.

above eighty inches in several years since records have been kept here. The periods of wet weather usually come in midwinter and midsummer, the spring and fall months being much the driest of the year. It is practically impossible to save such crops as corn and sorghum as dry forage; and crops such as cowpeas, soybeans, and grasses of any kind are usually saved with great difficulty.

Weather conditions make silos in this section almost essential to success. Silos, everywhere recognized as nec-

essary to good farming, are doubly necessary here. For equal money invested, more dry feed can be stored in a silo than in a barn, unless this forage is put into bales of hay or of shredded corn or sorghum. A one hundred ton silo will hold all the corn, stalks and all, that can be grown or twelve acres of land making forty bushels to the acre, and it can be built for $175. A crib and storage space for housing the grain and stover from the same acreage will cost more than this amount. As silage the corn can be saved with absolute success, regardless of weather conditions, and not two per cent of it will be wasted by the animals in eating it; but if we attempt to save this corn as grain and dry forage, as farmers frequently do in the North and West, three years out of four the stover will be all but ruined by frequent showers and damp weather, and the corn, when gathered and put in the crib, will doubtless be attacked by weevils and rats to the extent that an appreciable per cent of it will be ruined unless heroic measures are taken to combat both. This, of course, can be done at much trouble and expense about equal to that of cutting the silage; and ten per cent or more of the stover will not be eaten at all.

We believe that fifty per cent of the value of the average corn crop made in this section is represented in that part o fthe corn plant other than the grain. Though we know this to be approximately true, after fifteen years' experience in trying to save dry forage here in summer, we would not attempt to save corn stalks as dry forage. In the absence of a silo we would use the stalks merely as supports for velvet beans, depending on these very largely as winter feed for livestock.

The only serious objection to the general use of the silo in this country is the fact that many farmers have such small farms and so few cattle that they are not only unable to buy the machinery necessary to put up this silage, but are unwilling to invest so much money in machinery that most of them would not use for cutting silage more than two or three days in the year. In order to put up silage economically one would need a cutter and blower that would cost not less than one hundred dollars and a gasoline engine costing not less than than two hundred dollars. To tie up so much money in something to be used for so short a time would at least seem unreasonable. Nearly every farm of any

size could, however, use a gasoline engine for many other purposes besides cutting silage. The best solution of the problem would be for the farmers either to club together and buy the machinery or else to agree to have a single individual own the machinery and cut for his neighborhood. The McNeill station has done this for the farmers near the station. It has furthermore been instrumental in having four silos besides the three of its own built in a neighborhood that is perhaps more undeveloped than the average of even Southeast Mississippi.

So much has been written about the necessity and advantages of silos that a number of people, having got an exaggerated idea about the real feeding value of silage, have concluded that all there is to successful livestock raising is good silage. The truth is that silage alone is by no means a balanced feed, being almost too bulky when fed alone to support even a dry cow, much of it being water and the less nutritious parts of the corn or sorghum plants. It must be fed along with concentrated feeds like cottonseed meal, corn meal, wheat shorts, and the like. Not enough of even a rich concentrate like cottonseed meal can be fed with safety to make a balanced ration for a dairy cow that is being fed forty pounds of silage in twenty-four hours. The richness of silage depends very largely on the character of the crop from which it is made; and, of course, no one need expect as good results from silage made from corn stalks as from corn with the the ears left on.

For six winters we have fed our dairy cows a ration approximating four pounds of cottonseed meal and thirty pounds of silage daily in addition to such feed as the cattle got in the fields and pastures with some kind of hay when they were getting nothing on the outside. With such treatment we have secured a flow approximating 1½ gallons a day per cow, of milk that has tested an average of about four and one-half per cent butter fat.

BEEF CATTLE EXPERIMENTS WITH FORAGES AND PASTURES.

A little more than two years ago this station began an experiment of crossing native cattle on bulls of the beef breeds and has kept a record of the weights of the cows and calves at intervals throughout the year since the work began. So far we have Angus and Hereford crosses

only. Though the pastures on which they have been kept in summer have amounted to almost nothing, having been unimproved stump lands, the cattle and particularly the crosses, have done so well that we feel encouraged at the outcome. A number of the grade calves at one year old weighed more than four hundred pounds, which is more than the average of many of the grown cows. These grade calves are showing a decided superiority over native calves grown under the same conditions. We feel that when the pastures on which they are kept have been thoroughly cleared of stumps, bushes, and scattered trees, as is gradually being done and have been fertilized and set to better grasses, we will be able to grow animals that will compare favorably in cost and quality with those grown in the more favored parts of the state.

Last year we fed a herd of beef cows and calves, forty in number, an average of fifteen pounds of silage and one and one-quarter pound of cottonseed meal to the animal each day in addition to some gleanings that they got in the fields; and they gained a little in weight between the beginning of the feeding period, November 27 and the ending about April 1. Some of these cattle were sold on March 17; and on April 1 we turned 34 head of cows and calves on range and pasture when they weighed a total of 14,460 pounds. When these same cattle were put on feed again December 1, they had increased to forty-two head weighing 17,290 pounds.

In our opinion, which is based on experience here in handling the native cattle, sheep, and hogs, most of these animals have been so thoroughly starved during certain periods of their lives that they are generally either diseased or have very poor digestion. When they are turned on good pasture or are well fed, they fail to make the gains that might otherwise be expected. No amount or kind of feed at any reasonable cost can be profitably put into animals that have been half starved at any part of the year. If we hope to make a success of stock raising in this country, even with silage and without ticks, we must look to the growing of animals that have never had their digestive systems runied by insufficient feed at any period; and we must look also to the blood of these animals, seeing that as far as possible they are out of sires and dams that are the best of their kind. Too, much, however, must not be expected of good blood, for unless

we are prepared to give good feed and treatment the native scrub is decidedly the best of them all.

CORN.

Corn is the most universally grown of all the forage crops. Though its chief value heretofore has been as a grain crop, there are very few crops that surpass it for forage, and it is the most generally used of all silage crops. Though it does not yield the heavy tonnage that some of the sorghums give, it makes a silage superior in quality to sorghum and is much more easily handled by the average grower of these crops. For seven years this station has been putting up from fifty to two hundred tons of silage each year and has used corn very largely for making it. Corn for silage may be planted here at any time between the middle of March and the first of July. The long seasons permit it to mature even if planted as late as the middle of July, but usually insects are so bad late in the season that earlier plantings are more reliable. We much prefer to plant corn before the first of June.

Experience here has been that a ton of silage from average corn may be estimated for every five bushels of grain that the corn will make. A yield of five tons to the acre is all that may reasonably be expected from the average corn of the country though we have made here above twelve tons to the acre on the best land. It has cost us a little more than a dollar a ton to put this corn in the silo, but this cost could be reduced considerably with trained crews of men to handle the machinery and keep all things running harmoniously. Varieties of corn that have large stalks make the heaviest yields of silage though the proportion of ears to stalks is smaller and the quality of the silage not so good as that from varieties with smaller stalks. Goliad corn has an extremely large stalk with heavy leaves and has generally led all other varieties here in tonnage of silage. Where silage corn is cut by hand, the kinds that have the largest stalks can be handled more economically since it requires less effort to cut it in the field, haul, and feed into the cutter large stalks than those that are smaller.

SORGHUM.

The larger varieties of sorghum give the biggest yields of silage of any crops grown here. They can be highly recommended as silage crops. On April 25, 1916,

we planted one-half acre of land to Japanese sorghum and on August 17, cut and weighed the crop for silage. It gave 15.6 tons. The stubbles were then barred off, fertilized, and cultivated and on October 19 the sorghum was again cut before the seed were fully mature. This time it made 4.2 tons of silage, a total for the one-half acre of 19.8 tons, or at the rate of 39.6 tons to the acre. The quality of the silage made from these large varieties of sorghum, like the Japanese or Seeded Ribbon Cane, is not so good as made from the smaller varieties like the Amber or Orange, because the proportion of seed to stalk is so much smaller. The larger sorghum, when cut by hand, can, however, be handled more economically than the small, and makes an excellent silage which cattle relish and will consume with practically no loss. Sorghum is much more reliable than corn for growing under adverse circumstances; it can be depended upon if planted either early or late, the worms and dry weather affecting it much less than they do corn.

Under extremely adverse conditions sorghum will frequently help the stock man out of difficulties that, without it, might prove calamities. On the fifth day of July, 1916, this section was visited by a very destructive hurricane and waterspout which blew down corn, which was at the time silking and tasseling. The wind and rain blew and washed out all the pollen so that the ears made absolutely no grain. This was the case with a good deal of the corn that had been planted at the station for silage; when the corn was cut during the first days of August, the yield was little more than fifty per cent of what we expected. Although the land on which this corn had grown had become extremely foul from crab grass and though the continuous rainy weather made it impossible to get rid of this even with large turn plows, we prepared a seed bed as best we could, and on the fifteenth of August planted twelve acres of Amber sorghum. This came up to a fair stand and on October 17 had matured its seed and was cut into silage, yielding at the rate of 4.4 tons to the acre and enabling us to winter cattle that we would otherwise have been compelled to sell. Under similar circumstances corn would not have matured at all. Even if it had been planted early enough to have matured before frost, the worms and dry weather would have damaged it.

We do not recommend sorghum for dry forage here, since it is hard to cure at best, and showers are entirely too frequent to make it reliable. A number of other forage crops similar to sorghum have been repeatedly grown here and have given heavy yields, but the same causes make them unreliable for dry forage, though they have all been made into good silage. On April 25, 1916, one-twelfth acre plats were planted to each of the following crops and on August 5, they were cut for silage. The results of this experiment calculated in tonnage per acre are these: Cat Tail Millett, 30.6 tons; Shallu, or Egyptian Wheat, 9.4 tons; Broom Corn, 15 tons; Feterita, 9.4 tons; Yellow Milo Maize 8 tons; White Kafir Corn, 9.6 tons; Teosinte (cut August 17), 23.5 tons. The stubbles left from these crops were then barred off, fertilized, and cultivated, and such of them as sprouted were regularly worked and cut again for silage on October 19, with results again as follows: Cat Tail Millet did not sprout; Shallu, or Egyptian Wheat, 7.6 tons; Broom Corn, 6.5 tons; Feterita, 7.5 tons; Yellow Milo Maize, 6.5 tons; White Kafir Corn, 7.8 tons; Teosinte did not sprout from the stubbles. The land on which these crops and the Japanese sorghum grew had grown cabbage the winter before and had been highly fertilized with both animal manures and commercial fertilizers so that the foregoing yields cannot be taken as representative of what might be expected of same crops under average conditions that exist here.

VELVET BEANS.

For the small farmers of this section, or those who cannot have silos, the velvet bean is perhaps the most valuable of all the leguminous forage crops, though these beans, we must say, interfere considerably with the making and gathering of the corn and occupy the land too late in the winter to permit of growing winter cover crops. These beans make a lot of very valuable feed in the matured beans which ripen in a very tough pod which keeps them from decay all winter unless they are trampled into the ground. In addition to the fruit, these beans made an immense growth of leaves and vines, which, even after frost, are eaten to a considerable extent by livestock. That part of the litter remaining on the land when turned under will build up the soil faster than

anything else ever tried here except animal manures. After a crop of velvet bean vines has been turned into the soil, we have found that good results may be had from the use of raw phosphate rock in place of the treated rock or acid phosphate.

In order to fruit well velvet beans have to be planted with some crop that will support the vines. Corn is used almost entirely here as a companion crop for them, though sunflowers would do as well or better if they could be handled to advantage. These beans interfere seriously with the corn if the two crops are planted about the same time, for the vines will grow over the tops of the corn

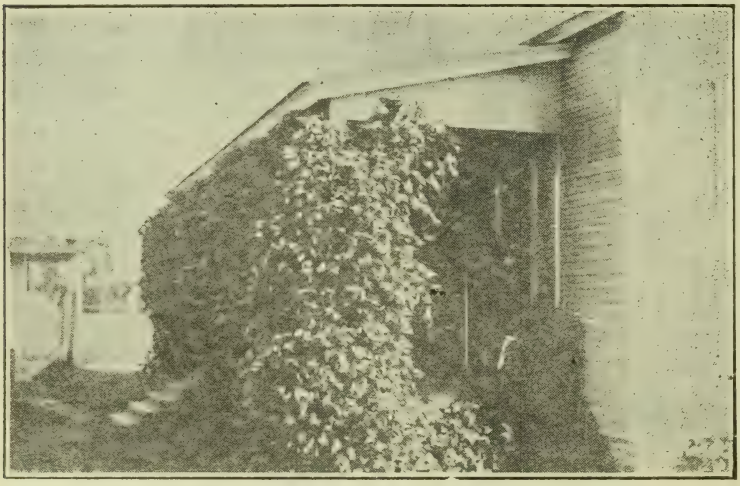


Fig. 4. THE VELVET BEAN USED AS SHADE.
The velvet bean, one of South Mississippi's most important crops, was first grown for ornamental purposes.

and interfere with pollination. Due to moisture caused by the dense shade and to pulling the ears to the ground, they will also cause the ears to rot on the stalks. In growing corn and velvet beans on the station farm, we have adopted the plan of using three foot rows. As early in the year as possible, we plant two of these to corn and some six weeks later plant the third row to velvet beans. With this difference in the dates of planting, the corn will get such a start of the beans that they will not interfere with pollination and the ears will mature before the bean vines get too rank to find them. As soon as the ears are

ripe enough to gather, we pull them by hand and pile them in heap rows as far apart as possible so as to tear down as few vines as possible in hauling out the corn. When this is done, the beans are left to occupy the land. At any time during the winter, after frost, the vines are grazed off. In grazing these beans, it is best to confine the animals to small areas by the use of cross fences, thus preventing the stock from wasting the beans by trampling them into the ground.

If planted early in the year we prefer the regular Florida or the Chinese velvet bean since both make a heavy growth of vine and fruit and will continue to grow until frost, but if the corn and beans are planted late in the season, as would be the case in planting them after oats or a crop of vegetables, we prefer the Yokahoma or the One Hundred Day Speckled Bean, since either will mature some beans if planted here by the middle of June. When planted late, there would be no necessity of gathering the corn, until after frost because the great enemy to corn in this country, the weevil, would not have time to destroy it in the field as would frequently be the case if early planted corn were allowed to stay in the field until frost, neither would the bean vines grow rank enough to pull the stalks down and rot the corn in this way.

Where silos can be had velvet beans are relatively nothing like so valuable a crop. They tangle so badly that if planted alone they could not be handled economically for silage, and if planted with corn, it would be next to impossible to cut the two crops and get them in the silo. We have found here that the best way to grow either corn or sorghum for silage is to plant it alone on the best lands and make no effort to grow a restorative crop with either one. If either crop makes any considerable tonnage of silage, it will necessarily grow so thick on the land as to completely shade out any crop, like peas or soy beans, that does not have an equally good chance to grow along with it by being planted at the same time. A number of times we have planted peas in silage corn at the last cultivation, and every time they have failed to do anything where the corn has given any reasonable tonnage. So, we believe it better to grow a crop of corn or sorghum alone for silage and, when this has been harvested, either to give an application of stable manure or to

plant peas or soy beans alone on the land. A crop of corn followed by sorghum is very hard on the land, but we could rather afford to grow the two in a single season and then give the land over to some restorative crop alone in case we haven't the manure, than try to grow both together.

The combination of sorghum and soy beans planted at the same time in the same or alternate rows will give good results so far as yields are concerned, and the two crops cut up together will give a better quality of silage than either crop alone, but with ordinary corn knives such as we have been compelled to depend upon for cutting silage crops (not having a harvester), we have found it difficult to cut and handle the beans. Even when they have been carried to the silage cutter, we have had a lot of trouble with the soy beans stopping up the blower pipe by going into the cutter sideways and being left in lengths too long to be blown through the pipes. These beans have in this way given so much trouble that with the small cutter used, we have actually thrown them aside rather than put up with the expense of shutting down the machinery so often to unstop the conveyor.

Although the velvet bean is a legume, and gets its nitrogen from the air, it has like every other plant we have tried to grow here been materially improved in yields by being planted on land fertilized with animal manures. This fact is proved by the results of tests with fertilizers conducted here in 1916 with velvet beans and corn. The results also go to show that on land well filled with vegetable matter about as good yields may be expected from the use of raw phosphate rock as from the same rock made soluble by being treated with sulphuric acid. This work was conducted on seven permanent fertilizer test plats set aside in 1907, and treated in the same way since that time. These plats of one-fourth acre each were laid off into rows three feet apart and on April 15 were planted alternate rows to corn and velvet beans, the One Hundred Day Speckled bean being used. These beans were gathered by hand on November 3. They gave yields of beans in the pods as follows, calculated in pounds of fertilizer used and beans gathered to the acre; 200 pounds of raw phosphate rock and 200 pounds of cottonseed meal, gave 2,600 pounds of beans; 200 pounds of acid phosphate and 200 pounds of cottonseed meal, 2,400

pounds of beans; 200 pounds of acid phosphate, 200 pounds of cottonseel meal, and 200 pounds of kainit, 2,160 pounds of beans; 12 tons of animal manure and 200 pounds of raw phosphate rock, 3,080 pounds of beans; 200 pounds of acid phosphate alone, 2,120 pounds of beans; 200 pounds of raw phosphate rock alone, 2,160 pounds of beans; 12 tons of animal maunre alone, 2,880 pounds of beans.

A test was also made here in the spring of 1916, showing the yields of several varieties of velvet beans planted in alternate rows with corn on April 15, the corn rows being fertilized with a mixture of acid phosphate and cottonseed meal, and the beans with acid phosphate alone. These beans were gathered November 6 and weighed finally on December 12. The yields, as follows, were calculated in pounds of beans in the pod to the acre: Chinese, 4,400 pounds; Yokahoma, 850 pounds; Florida, 1,870 poouds;; 01846D, 2,380 pounds; 01815C, 1,530 pounds; 01846C, 1,190 pounds; One Hundred Day Speckled, 2,040 pounds. The seed of these beans were furnished by Professor S. M. Tracy, Special Agent of the U. S. Department of Agriculture, Biloxi, Mississippi.

Another experiment was conducted the same year, at the same place, and in the same way, to show the effects of different dates of planting on the yields of velvet beans, the corn with which they grew having been planted at the same time. The One Hundred Day variety of speckled beans was used in this experiment and the following yield of beans in the pods calculated in pounds per acre, were obtained:

Planted April 15, yield	2,040 pounds
Planted May 1, yield	1,700 pounds
Planted May 15, yield	1,530 pounds
Planted June 1, yield	680 pounds
Planted June 15, yield	680 pounds.
Planted July 1, yield	510 pounds

COW PEAS.

The cowpea is the best of all the leguminous hay crops except lespedeza. It makes as good growth of vine as one might expect in any part of the state on lands of the same degree of fertility. On account of frequent summer showers, we suppose, peas do not, however, fruit well in this immediate territory; and, of course, the fre-

quent showers make it difficult to save the vines into a good quality of hay. We do not regard the crop as being adapted as a silage crop though it will make good silage, especially if mixed with about two parts of corn. The California Black Eye pea planted here in the early spring has been the best fruiter of all the varities tested. These peas bring good price on the market for human consumption, and they make an excellent early grazing crop for hogs. We have generally been disappointed in results from planting peas in corn at the last cultivation as is done so successfully in other parts of the state. We have about come to the conclusion that it does not pay to plant peas and corn together unless they are planted each in a separate row and about the same time. Peas are an excellent crop with which to follow oats. When planted in this way they can be saved into a fine quality of hay. Lespedeza, however, when it is generally introduced into this country will make even a better crop for following oats, because it can be grown at less trouble and expense when once seeded on the land; and it can be saved into a first-class quality of hay in much less time than cowpeas and will generally make a greater tonnage.

SOY BEANS.

We believe soy beans are destined to be the most valuable of all crops of its kind for South Mississippi. It is a sure fruiter. The beans are the richest natural vegetable food that we know, being almost as rich in fats and proteids as cottonseed meal, a manufactured article. These beans are quick growers; planted after a crop of oats or vegetables of any kind, they will mature a heavy crop of beans. They are easily cut and saved if allowed to ripen pretty thoroughly in the field. Either the beans may be threshed out, or beans, vines, and leaves may be ground into a nutritious meal. We believe the time will come when these beans will enable the South Mississippi farmer to grow the larger part of his feed for any class of livestock. At present he is compelled to depend very largely on cottonseed meal as a concentrate to furnish fats and nitrogenous materials in the feeds. Soy beans are the most reliable of all crops that we have grown here, for hogs; and if planted at intervals through the spring and summer, they will furnish good grazing for hogs over a longer period than any other crop of the kind.

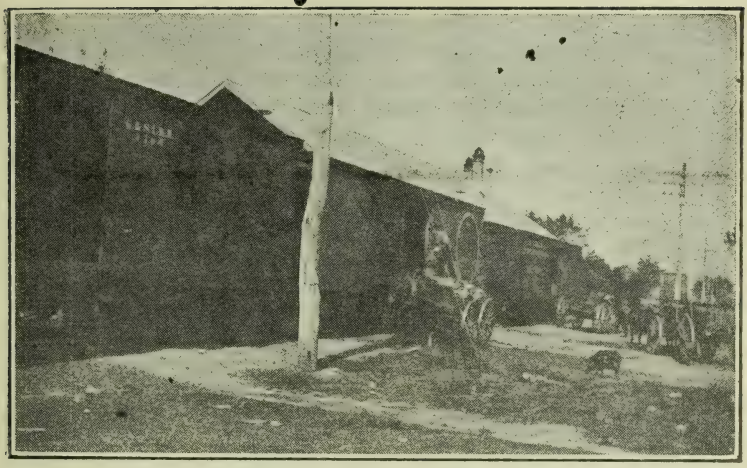


Fig. 5. SHIPPING SWEET POTATOES IN CARLOAD LOTS. Not only are sweet potatoes an important hog feed but are becoming one of South Mississippi's most profitable cash crops.

THE RELATION OF FORAGE CROPS TO HOG RAISING.

It is well here to remark that the growing of hogs is the safest and easiest line of livestock production that the average small farmer of South Mississippi can engage in. While we can produce good pasture and forage crops on account of the sandy nature and consequent absence of humus, the soils do not grow grasses and forage crops as cheaply as do the stiffer and richer soils of other parts of the state, but they have a peculiar advantage in growing many of the root crops such as chufas, peanuts, cassava, and sweet potatoes, all crops that make cheap and good pork, especially when fed with corn and good grass. A mistake the people of this section have nearly always made has been in thinking the hog is never a grazing animal. The fact is our Bermuda pastures here are about as valuable for pork production as they are for butter and beef. It requires a considerable outlay of money to start in the beef business anywhere, less into the dairy business, and still less into sheep; but when it comes to hogs any thrifty boy in the family can get largely into the hog business in one year, and we know that no other business makes such quick money as hog raising.

NEW GRASSES

In an experimental way the McNeill Station has tested a large number of grasses and forage plants that we do not discuss here in detail because we do not believe they can be economically used by the people generally. The new grasses, such as Para grass, Guinea grass, and Rhodes grass, have all been grown here for several years and have given good results, especially the two first mentioned; and we believe on the strength of work done here that any of these grasses might prove valuable additions to the list of pasture and forage crops for the South Mississippi farmers who are willing to take the trouble of getting them started. The Para and Guinea grasses are propagated by cuttings of the runners and by divisions of the old roots respectively, though the Guinea grass is also propagated by seed.

The Para grass, best suited to damp land, will grow well on the margins of ponds and on ditch banks. Guinea grass, better suited to high and dry land, grows in large clumps and attains a height of six feet. It is supposed to sprout out from the roots left in the soil through the winter, but here it has been largely killed by the freezes. Para grass is also a perennial and spreads by surface runners which sometimes attain a length of thirty feet and when they cover the ground the runners assume an erect position and may be cut for hay. This grass, too, is not winter killed in parts of Florida and Texas, where it is most grown in this country, but plantings here while not entirely destroyed in winter have been seriously hurt by the cold.

CONCLUSION.

As previously stated, this unbiased information is given as much for the prospective farmer in South Mississippi as for those already here. As a matter of fact there are, comparatively speaking, very few farmers already here, especially in the portion of territory to which these remarks are most applicable. Unless we get new immigrants, it will be a long time before the country is developed. The cheapest lands in the civilized world today are in South Mississippi; in the southwestern part of the state, on account of the ravages of the boll weevil, and in the southeastern part of the state because so much land has been left idle and unpro-

ductive after the saw mills have cut the timber. Fully two-thrds of the lands of the state are now idle. Of this unused land much more is in southeast Mississippi than in other parts of the state. In fact, many of the counties in southeast Mississippi have less than five per cent of their soils improved. As a consequence these lands are paying their present owners very little, nothing like enough for taxes on the cut-over lands themselves and of course they can be bought very cheaply as compared to other lands of no more potential value in other parts of the United States. The greatest need of South Mississippi today is an influx of people who will utilize these lands, people who are willing to put up with the temporary hardships of pioneers, for there is certainly nothing easy about developing farms out of raw pine lands.

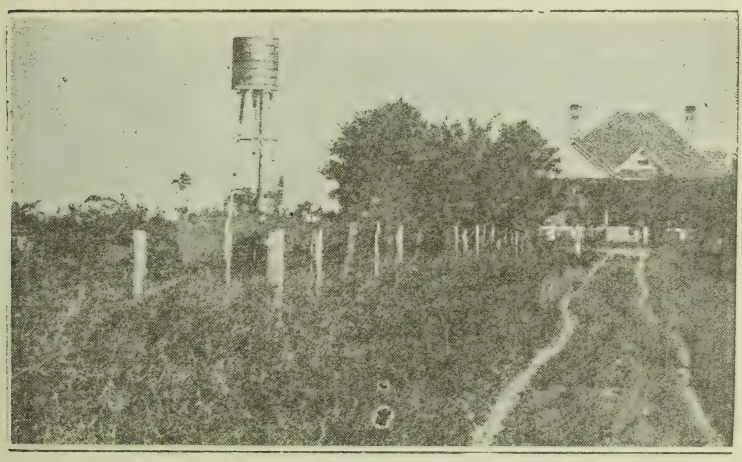


Fig. 6. A SOUTH MISSISSIPPI HOME.

In the past, some effort has been made to get immigrants nto this country, largely by persons who were more interested in the sale of the land at fancy prices than they were in the final success of those who bought these lands. Wonderful stories have been told about what such lands would produce. These stories were based on what some small area had produced under the most favorable circumstances. Since fruits and vegetables are crops which occasionally give the highest money returns to the acre when seasons and markets happen to hit just right,

such crops have usually been recommended as those best suited for the new comers to grow. While the soils of the section are well suited to growing fruits and vegetables on the well improved areas, by people trained for such special work, we would not think of planting the average vegetable on raw pine lands, though strawberries will do well when so planted. We believe that the people who invest in South Mississippi lands at reasonable prices and go gradually into the business of raising some form of livestock, will in the end succeed, provided they apply the same business principles necessary to success in any other business. We have seen many immigrants come into this country expecting to realize huge profits from growing fruits and vegetables. They have more often than otherwise left disgusted if they have been able to leave at all. We have also seen some among just such immigrants go gradually into some form of the livestock business, and they have slowly but surely made a success.

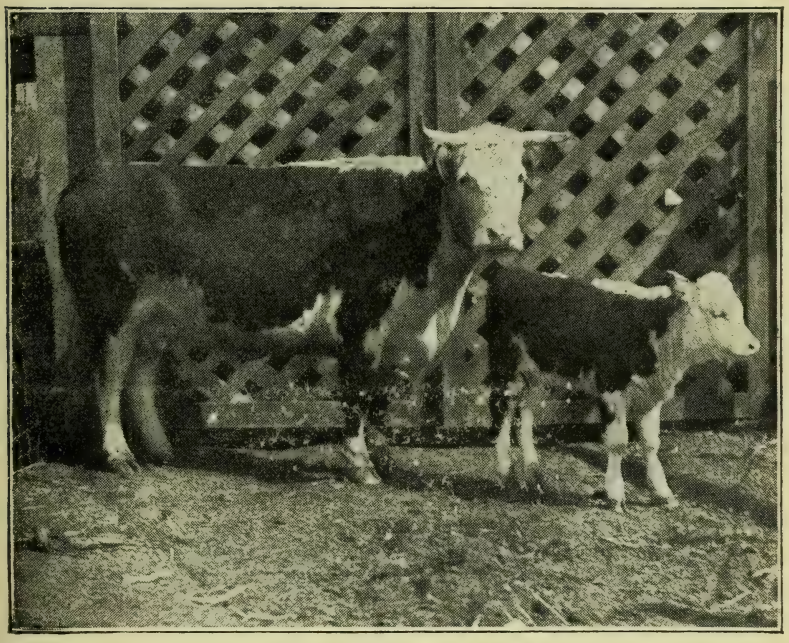
Livestock is the basis of all successful agriculture in the broadest sense of the term; and good pastures and forage crops are the most essential elements that enter into success with livestock. We believe that the question of making better pastures and of growing more forage crops at less cost is one of the most vital questions before the country today. Success with pastures as well as with any other crop depends more on rich soils than on anything else. The quickest and best way to get this rich soil is through the manure from livestock and the many leguminous forage crops this livestock will enable us to grow.

MISSISSIPPI
AGRICULTURAL EXPERIMENT STATION

BULLETIN NO. 181

EMERGENCY COW FEEDS

BY H. K. GAYLE



AGRICULTURAL COLLEGE, MISSISSIPPI
AUGUST, 1917

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* In coöperation with the United States Department of Agriculture.

EMERGENCY COW FEEDS

BY H. K. GAYLE

Introduction

The annual waste of forage and fodder feedstuffs throughout the Southern States has been often estimated to be sufficient to feed all the cattle in the South through the entire winter.

Corn fields are given very little consideration after the corn has been snapped from the stalk; as a result, from one-fourth to one-third of the feeding value of the corn crop has been left to decay in the fields. Pastures, ditch banks, roadsides, etc., produce annually a tremendous amount of forage, in the form of native grasses, which is usually left to decay on the ground or to be burned off during the fall and winter.

To cut the native grasses from such places will not only make a good forage when saved as hay, but improve the pastures greatly, by destroying weeds and making the stand of grasses thicken. The roadsides, ditch banks, etc., would most certainly be improved in appearance by mowing.

Cotton fields that have been severely damaged by the boll weevil can be turned into an asset, by simply mowing the cotton stalks while heavy with leaf and making them into hay or silage.

Mature cattle are admirably adapted to the economical use of such coarse feeds. Breeding cows and steers that are over one year old can be wintered on such feeds if given a very small amount of supplementary concentrate.

EMERGENCY COW FEEDS

Object of the Work

The object of the experiments described in this bulletin was to determine the practicability of utilizing various waste forages for wintering breeding beef cows, and to determine the approximate feeding values of the forages used.

Feeds Used

Cottonseed meal was used as the supplementary concentrate throughout all lots, and was fed at the rate of one pound of cottonseed meal per cow daily.

The roughages used were:

1. Pasture grass hay.
2. Oat straw.
3. Corn stalks, Johnson grass, etc., as cut from stalk fields.
4. Cured cotton stalks.
5. Cotton stalk silage.
6. Silage mixture of cotton stalks and sorghum.

Cottonseed meal was valued at $40.00 per ton throughout. The forages used were valued at the labor cost of saving them. Oat straw, however, was valued at $5.00 per ton.

Cattle Used

The cattle used throughout were breeding cows, eight to ten years old and averaging about 800 pounds in weight. They were all of native scrub stock.

Shelter

All lots of cattle were kept under shelter every night throughout the experiment. The shelter was a good barn open on the south side. Exercise lots were available for the cows during the day time in good weather. Fresh, clean water was available at all times.

Lot No. 1

Pasture Grass Hay

Lot 1 was made up of four cows. The hay fed was cut from pastures, ditch banks, etc., and was of wild native grasses. No

extra effort was made to get hay of unusual quality. Most of it was over-ripe; it had been left in the sun too long to be cured as good hay. It was representative of average waste hay from native grasses. This hay was put in the barn at a labor cost of $2.60* per ton.

The following table shows the results of feeding pasture grass hay to a lot of four breeding cows. The cows were given all the hay they would clean up each day.

TABLE I

Length of Feeding Period	Average Initial Weight per Cow	Average Final Weight per Cow	Average Gain per Cow	Average Daily Ration Per Cow in Pounds		Cost of Ration per Day
				Cotton Seed Meal	Hay	
28 Days	818.6	836.25	17.65	1.0	28.53	$ .057

The foregoing table shows that waste hay with a small amount of cottonseed meal makes a satisfactory ration for breeding cows and a very cheap ration, costing only $0.057 per cow per day.

Lot No. 2

OAT STRAW

This lot was made up of four cows. The oat straw was good bright straw. It was blown into the barn loft direct from the thresher and was fed in such amounts as the cows would clean up daily. The following table shows the results of the twenty-eight day test of feeding oat straw valued at $5.00 per ton.

TABLE II

Length of Feeding Period	Average Initial Weight per Cow	Average Final Weight per Cow	Average Gain per Cow	Average Daily Ration Per Cow in Pounds		Cost of Ration per Cow Daily
				Cotton Seed Meal	Hay	
28 Days	776.9	829.0	52.1	1.0	24.8	$ .082

As this table shows, cows can be wintered on oat straw and a little cottonseed meal with unusually good results; the cows make good gains at a daily cost of only $0.082 per cow.

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* All data bearing on the yields per acre and the valuations of forages were supplied by the Agronomist of this Station.

Lot No. 3

Corn Stalks, Johnson Grass, Etc.

Four cows were used in this lot. The forage fed was cut with the mowing machine from the corn fields after the corn had been gathered, and was stacked outside the barn. It consisted of corn stalks, grasses, weeds, etc. The stalk fields yielded this forage at the rate of two and one-half tons per acre, and the cost to cut and put in the stack was $1.32 per ton.

The results of feeding this roughage are shown in the following table:

Table III

Length of Feeding Period	Average Initial Weight per Cow	Average Final Weight per Cow	Average Loss per Cow	Average Daily Ration Per Cow in Pounds		Cost of Ration per Cow Daily
				Cotton Seed Meal	Corn Stalk Forage	
28 Days	817.5	785.5	32.0	1.0	38.06	$ .045

The table shows that the forage of corn stalks, weeds, etc., as cut from the corn fields, is not a satisfactory roughage for wintering cows, but that when no other forage is available it can be used, and makes a remarkably cheap feed.

Lot No. 4

Cured Cotton Stalks

The forage fed to this lot of four cows for twenty-eight days consisted of cured cotton stalks. The cotton stalks were cut from a field which had been practically destroyed by the boll weevil. It was cut before many of the leaves had fallen and was cured as hay and stacked out of doors. Such forage yielded at the rate of one ton per acre and was put into the stack at a labor cost of $2.30 per ton. The cows were given all the cotton stalks they would clean up each day. Table IV shows the results of feeding cured cotton stalks as a roughage to breeding cows.

Table IV

Average initial weight per cow	813.25	pounds
Average weight per cow at end of 14 days	777.	"
Average loss per cow during first 14 days of test	36.25	"
Average weight per cow at end of 28-day test period	802.5	"
Average gain per cow during last 14 days of test	25.5	"
Average loss per cow during whole test period	10.75	"

Average daily ration per cow during first fourteen days of test.....	Cottonseed meal . .	1.	pounds
	Cured cotton stalks	18.32	"
Average daily ration per cow during last fourteen days of test.....	Cottonseed meal . .	1.	"
	Cured cotton stalks	36.66	"
Average daily ration per cow during entire 28 days feeding period....	Cottonseed meal . .	1.	"
	Cured cotton stalks	27.48	"

Average waste of cotton stalks as unedible part of stalk 58.89%

Average cost of ration per cow, daily..... $ .052

This table shows that cotton fields ruined by the boll weevil can be utilized as a feed for wintering mature beef animals. The inference to be drawn is not that cotton can be grown profitably as a feed crop, but that it may be salvaged after being damaged severely by the boll weevil and when other roughage is scarce.

It was hard to get the cows to eat enough of the cured cotton stalks, as they were tough and hurt the cows' mouths while picking over them. The cows did pick off the leaves, but left the stalks—about 59% of the total weight of the forage—as unedible.

After the cows became accustomed to eating cotton stalks, they ate them fairly well and made good gains during the last fourteen days of the test period. Deducting from the ration the 58.89% of waste, we find that the cows actually consumed an average daily ration of cottonseed meal, 1 pound; cured cotton stalks, 11.3 pounds.

Lot No. 5

Cotton Stalk Silage

The four cows in this lot were fed on silage made from cotton stalks which had been cut from a field severely damaged by the boll weevil. The cotton was cut while heavy with leaf; it yielded at the rate of four and a half tons of silage per acre. The expense of putting it into the silo was $2.70 per ton.

Table V shows the results of feeding cotton silage to breeding cows for a test period of twenty-eight days.

Table V

Average initial weight per cow.....	784.4	pounds
Average final weight per cow.....	823.1	"
Average total gain per cow.....	38.7	"
Average daily gain per cow.....	1.4	"

Average daily ration per cow	Cottonseed meal	1.	pounds
	Cotton silage . .	51.	"
Percentage waste (unedible stalks)		24.15	%
The average daily ration actually consumed per cow was	Cotton silage . .	38.68	pounds
	Cottonseed meal	1.	"
Cost of ration per cow daily			$ .089

The table shows that cotton stalks can be made into a silage when cut before the leaves have fallen, that the silage is high in feeding value, and can be used for wintering breeding cows in good shape.

Lot No. 6

Sorghum and Cotton Silage

The roughage used in Lot 6 was a silage mixture of sorghum and cotton stalks. The case had arisen in which there was not enough sorghum to fill the silo. A field of cotton had been ruined by the boll weevil. Both crops were cut and mixed at the silage cutter by running through the cutter first a load of sorghum and then a load of cotton stalks. On weighing the loads of each sorghum and cotton stalks, it was found that the mixture by weight was in the proportion of one-third cotton stalks and two-thirds sorghum. If sorghum silage is worth $3.00 per ton, and cotton silage is worth the cost of putting it into the silo, $2.70 per ton, the silage mixture of two-thirds sorghum and one-third cotton stalks is worth $2.90 per ton.

Table VI shows the results of feeding this silage mixture to a lot of four breeding cows.

Table VI

Length of feeding period		28	days
Average initial weight per cow		802.5	pounds
Average final weight per cow		815.5	"
Average total gain per cow		13.	"
Average daily ration per cow	Cottonseed meal	1.	"
	Cotton and sorghum silage	49.9	"
Cost of ration per cow daily			$ .092

The table shows that cotton stalks can be combined with sorghum and made into a silage which will furnish a good roughage for cattle, and that when fed with a small amount of cottonseed meal will allow the animal to gain in weight.

Bulletin No. 182 June 1917

Silages for Fattening Steers

By H. K. GAYLE and E. R. LLOYD

FEEDING SHED WHERE TESTS WERE MADE

The Feeding to Fattening Steers of Corn Silage, Early Amber Sorghum Silage, Peavine and Johnson Grass Silage, Corn Stover Silage, Cottonseed Hulls, Texas Seeded Ribbon Cane Silage, Corn and Sorghum Silage, and Corn and Soy Bean Silage.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

Facts About Silage

Yields of Silage per acre.—In the experiment conducted the yields of various silages from lands of equal fertility are as follows: Texas Seeded Ribbon cane, 15.25 tons of silage to the acre; Goliad corn, 9.9 tons; Early Amber sorghum, 8.6 tons; Mosby corn, 6.33 tons; Goliad corn stover, 6.2 tons; cowpeas and Johnson grass, 4.5 tons; Mammoth Yellow soy beans, 4 tons; cowpeas, 3.6 tons.....Page 4.

Feeding Value of Silage.—When steers were fed 137 days, one pound of Goliad corn silage was found to be equivalent to 1.12 pounds of Early Amber sorghum silage; or 1.35 pounds of cowpea and Johnson grass silage; or 2.73 pounds of corn silage; or 0.66 pounds of cotton seed hulls. When steers were fed 92 days one pound of Goliad corn silage was found to be equivalent to 1.13 pounds Texas Seeded Ribbon cane silage; or 0.9 pounds of equal parts mixture of Goliad corn and Early Amber sorghum silage; or 0.83 pounds of equal parts mixture of Goliad corn and Mammoth Yellow soy bean silage.....Page 8.

The Highest Total Profit per Steer on five lots of steers was made by the five steers receiving Goliad corn silage, the profit being $12.98 a head. In four other lots the largest profit was made by twelve steers fed a mixture of corn silage and soy bean silage. The profit was $9.01 a head.....Page 10-11.

Return per Dollar Invested.—When all costs, including interest at 8 per cent, were counted, corn silage, and mixtures of corn and sorghum silage, and corn and soy bean silage gave the best returns per dollar invested.....Page 12.

Silages for Fattening Steers

By H. K. Gayle and E. R. Lloyd

INTRODUCTION

Since ensilages of various kinds have come to play a very important part in the production of beef, the question of just what is the most economical silage crop is often presented. Practically every feed crop grown on the farm can be made into ensilage at some stage of its growth.

The silages fed in the experiments described in this bulletin were valued on the basis of the average market value of corn silage. An emergency, however, might so change the relative values of the silages used in these tests that the silages herein shown to be unprofitable might be utilized to advantage, especially in the wintering of breeding cows or the wintering of stocker steers.

The experiments cover the feeding of seven different silages to ordinary Southern steers. The silages were:

a Corn silage made from Goliad corn.

b Sorghum silage made from Early Amber sorghum.

c Silage made from equal parts of peavines and Johnson grass.

d Silage made from corn stover. The corn was allowed to mature; the grain was gathered; and as the stover was put into the silo enough water was added to preserve it.

e Sorghum silage made from Texas Seeded Ribbon Cane.

f Silage made from a mixture of equal parts of Goliad corn and Early Amber sorghum. In this instance the corn was allowed almost to mature before being cut.

g Silage made from a mixture of equal parts of Goliad corn and Mammoth Yellow soy beans.

As a basis for comparing the silages with a dry roughage, cottonseed hulls were fed to one lot of steers.

Part I, gives the practical results of the feeding of the different silages; Part II, shows the relation of the nutrients consumed to the beef produced.

PART I

THE FEEDING OF VARIOUS SILAGES
COST OF FEEDS

Table 1 shows the cost of production and the average market values of the feeds used. The first two columns, showing the yield per acre from lands of equal fertility and the costs of production, are results of several years' work by the Agronomist of the Mississippi Experiment Station. In computing the costs of production no charges were made for rent of land; in the computation only the costs of labor, the interest at 6 per cent on money invested in farm machinery, and its depreciation in value from wear are included.

All silage mixtures were made at the time of putting the crops into the silo; the crops were grown separately and mixed at the silage cutter.

The cottonseed meal, corn and cob meal, and cottonseed hulls were valued at current market quotations. The corn silage was valued at $3 a ton, its average market value; the other silages were valued on this basis—that their cost of production bore to that of corn silage.

TABLE I

Cost of Production and Average Market Value of Feeds.

FEED	Yield per acre tons	Cost per ton put into silo	Average market value per ton	Average market value per cwt.
Cottonseed meal	.....	$	$30.00	$1.50
Corn and Cob meal (Corn at 75 cts. a bu. and costing 5 cts. a bu. to grind)	.....	.....	22.85	1.14
Cottonseed hulls	.....	.....	7.00	.35
Waste hay	.....	.....	5.00	.25
Goliad corn silage	9.9	1.45	3.00	.15
Early Amber sorghum silage	8.6	1.53	3.16	.16
Cowpeas and Johnson grass silage	4.5	2.81	5.81	.29
Corn stover silage	6.2	1.90	3.93	.19
Texas Seeded Ribbon cane silage	15.25	1.26	2.61	.13
Mixture equal parts Goliad corn and Early Amber sorghum silage	.....	1.49	3.08	.15
Mixture equal parts Goliad corn and Mammoth Yellow soy bean silage	.....	2.00	4.14	.207
Soy beans (Mammoth Yellow)	4.	2.56	.....	.....
Cow peas	3.6	2.93	.....	.....
Mosby corn	6.33	1.75	.....	.....

The foregoing table shows that from lands of equal fertility and area Texas Seeded Ribbon Cane yields about 50 per cent greater tonnage of silage than Goliad corn; that early Amber sorghum yields about 10 per cent less tonnage of silage than Goliad corn; that Mosby corn yields about one-third less tonnage than Goliad corn; that about two-thirds as much silage can be made per acre from corn stover as from the whole plant; and that cowpeas and soy beans yield about two-fifths as much tonnage of silage as Goliad corn. The table shows further that the cheapest silage per ton put into the silo was Texas Seeded Ribbon Cane, which cost $1.26 a ton. The next cheapest silage was Goliad corn, costing $1.45 a ton. Early Amber sorghum silage cost $1.53 a ton; Mosby corn silage cost $1.75 a ton; and Goliad corn stover silage cost $1.90 a ton. Mammoth Yellow soy beans made silage costing $2.56 a ton, cowpeas made silage costing $2.93 a ton, and cowpeas and Johnson grass mixed made silage costing $2.81 a ton.

CATTLE USED

The experiment required two winters for completion—1914-15 and 1915-16. The cattle used each season were a fairly uniform bunch of native Southern steers slightly above the average in quality; they were bought locally.

Lots 1, 2, 3, 4, and 5, which were fed during the winter of 1914-15, averaged about 900 pounds at the time they were placed on feed. They were bought at $6 a hundred weight. Lots 6, 7, 8, and 9, fed during the winter of 1915-16, averaged about 750 pounds when placed on feed. They were bought at $5.50 a hundred weight.

CONDITIONS OF THE EXPERIMENT

All steers were dehorned just before going on feed. The steers were fed all winter in a shed open on three sides and shielded by a five-foot wall on the north side. (See front cover).

Lots 1, 2, 3, 4, and 5 were fed cottonseed meal as the sole concentrate, the first four lots receiving the same amount of each silage daily.

Lots 6, 7, 8, and 9 were started on a ration of two parts of cottonseed meal and one part of corn and cob meal and were fed some waste hay until they took a full ration of silage. The corn and cob meal and hay were discontinued after two weeks, and only cottonseed meal and silage fed thereafter.

RESULTS

Table II shows the length of the feeding period, the average daily ration, and the gains made per steer for each lot. All steers were given all the silage they would clean up daily.

Attention is called to the fact that lots 1, 2, 3, and 4, being made up of larger steers, consumed a larger quantity of silage daily than did lots 6, 7, 8, 9.

TABLE II

Duration of Feeding Period, Average Daily Ration, Gains

Lot	SILAGE FED	Length of Feed Period Days	Average Initial Weight per Steer Pounds	Average Total Gain per Steer Pounds	Average Daily Gain per Steer Pounds	Average Daily Ration per Steer			
						Cotton-seed Meal Pounds	Corn and Cob Meal Pounds	Silage Pounds	Waste Hay Pounds
Fed During Winter 1914-15									
1	Goliad corn silage	137	887.8	243.8	1.78	6.5	.....	45.32	.....
2	Early Amber sorghum silage	137	902.8	216.8	1.58	6.5	.....	45.32	.....
3	Equal parts mixture cowpea and Johnson grass silage	137	809.06	179.8	1.31	6.5	.....	45.32	.....
4	Goliad corn stover silage	137	941.25	71.4	.65	6.5	.....	45.32	.....
5	Cottonseed hulls	137	809.06	216.8	1.58	6.5	.....	27.15	.....
Fed During Winter 1915-16									
6	Goliad corn silage	92	791.16	140.1	1.52	4.967	.462	39.13	1.84
7	Texas Seeded Ribbon cane silage	92	715.9	125.4	1.36	4.967	.462	39.71	1.84
8	Equal Parts Mixture Goliad corn and Early Amber sorghum silage	92	735.23	158.5	1.72	4.967	.462	39.95	1.84
9	Equal Parts Mixture Goliad corn and Mammoth Yellow soy bean silage	92	746.25	173.8	1.88	4.967	.462	40.27	1.84

TABLE III

Feeds Consumed per Pound of Gain and Cost.

		CONCENTRATES						ROUGHAGES					
		Cotton seed meal, pounds	Cost	Corn and cob meal, pounds	Cost	Grain consumed per lb. gain, pounds	Cost	Silage, pounds	Cost	Waste hay, pounds	Cost	Cost Roughage	Total cost per pound gain
	1914-15												
Lot 1	Goliad corn silage	3.65	.0547			3.65	.0547	25.88	.0388			.0388	.0935
Lot 2	Early Amber sorghum silage	4.10	.0615			4.10	.0615	29.10	.0459			.0459	.1074
Lot 3	Cowpeas and Johnson grass silage	4.95	.0742			4.95	.0742	35.09	.1019			.1019	.1761
Lot 4	Goliad corn stover silage	9.97	.1495			9.97	.1495	70.70	.1389			.1389	.2884
Lot 5	Cottonseed hulls	4.10	.0615			4.10	.0615	17.16	.06			.06	.1215
	1915-16												
Lot 6	Goliad corn silage	3.26	.0489	.303	.0034	3.563	.0523	25.68	.0385	1.20	.003	.0415	.0938
Lot 7	Texas Seeded Ribbon Cane silage	3.61	.0546	.339	.0038	3.949	.0584	29.13	.038	1.34	.00335	.04135	.0998
Lot 8	Mixture equal parts Goliad corn and Early Amber sorghum silage	2.88	.0432	.268	.00305	3.245	.04625	23.19	.0348	1.06	.00265	.03745	.0837
Lot 9	Mixture equal parts Goliad corn and Mammoth Yellow Soy bean silage	2.62	.0393	.244	.00278	2.864	.04208	21.31	.0441	.972	.00246	.04656	.0886

Table III shows the feeds consumed per pound of gain, their respective costs, and the total cost per pound of gain.

More information of practical value is contained in table III than in any other in this bulletin. Conclusions are too frequently drawn from financial statements alone. The costs of feed grown on the farm vary widely; and it is easily possible that under unusual conditions certain rations might be used profitably, which under normal conditions could be used only at a loss. Financial statements should, therefore, not be the bases of comparisons. The beef produced from different rations is fairly constant under most conditions; hence should be the basis of comparison after the feed costs have been adjusted to particular conditions.

Based on the roughages required per pound of gain, the equivalent feeding values of the different silages used would be as follows:

When Steers are fed 137 days:

Goliad corn silage, 1 pound of the silage is equivalent to
- 1.124 pounds Early Amber Sorghum silage, or
- 1.355 pounds Cowpea and Johnson grass silage, or
- 2.732 pounds corn stover silage, or
- .663 pounds cottonseed hulls.

When Steers are fed 92 Days:

Goliad corn silage, 1 pound of the silage is equivalent to
- 1.134 pounds Texas Seeded Ribbon cane silage, or
- .903 pounds equal parts mixture Goliad corn and Early Amber sorghum silage, or
- .833 pounds equal parts mixture Goliad corn and Mammoth Yellow soy bean silage.

Table III shows that Goliad corn silage, when steers are fed 137 days, produces per steer a daily gain of .2 of a pound larger than that produced by either Early Amber sorghum silage or cottonseed hulls; a daily gain of .47 of a pound larger than that produced by a silage mixture of peavines and Johnson grass; and 1.13 pounds larger than the gain produced by stover silage.

When steers are fed 92 days and given all of each silage that they will clean up daily, a silage mixture of equal parts Goliad corn and Mammoth Yellow soy beans produces per steer a daily gain of .36 of a pound larger than that produced by Goliad corn silage; again, a silage mixture of equal parts Goliad corn and Early Amber sorghum produces per steer a daily gain of .2 of a pound larger than that produced by Goliad corn silage; finally Goliad corn silage produces per steer daily .16 of a pound more than silage made from Texas Seeded Ribbon Cane.

The cheapest gain, as shown in table III, was made by the lot of steers fed on the silage mixture of Goliad corn and Early Amber sorghum, which cost $.0837 a pound. The next cheapest gain was made by the steers fed the silage mixture of corn and soy beans, which was $.0886 a pound. The third and fourth cheapest gains were made by the two lots fed Goliad corn silage, the cost per pound of gain for these lots being $.0935 and $.0938 respectively. Lot 7, fed Texas Seeded Ribbon Cane silage, made gains costing $.0998 a pound. Lot 2, fed Early Amber Sorghum silage, gained at the cost of $.1074 a pound. The gains made by Lot 5, fed cottonseed hulls, cost $.1215 a pound. The gains

made by lots 3 and 4, fed on cowpea and Johnson grass silage and on corn stover silage, were very expensive; the gains made by lot 3, fed cowpea and Johnson grass silage, cost $.1761; the gains by lot 4, fattened on corn stover silage, cost $.2884 a pound.

The financial statement, table IV, shows the expenditures, receipts, and profit or loss per steer from each lot of steers.

TABLE IV

FINANCIAL STATEMENT
1914-15

LOT 1

To five steers, 4,439 lbs. @ $6.00 a cwt.	$266.340	
To 4,450 lbs. cottonseed meal @ $30.00 a ton	66.750	
To 31,550 lbs. Goliad corn silage @ $3.00 a ton	47.325	
To freight, commission, yardage, etc.	17.510	
Total expenditures	397.925	
By sale of five steers, 5,610 lbs. @ $8.25 a cwt.		$462.825
Total net profit		64.900
Average net profit per steer		12.980

LOT 2

To five steers, 4,514 lbs. @ $6.00 a cwt.	$270.840	
To 4,450 lbs. cottonseed meal @ $30.00 a ton	66.750	
To 3,150 lbs. sorghum silage @ $3.16 a ton	49.849	
To freight, commission, yardage, etc.	17.510	
Total expenditures	404.947	
By sale of five steers, 5,450 lbs. @ $8.25 a cwt.		$449.625
Total net profit		44.678
Average net profit per steer		8.933

LOT 3

To five steers, 4,453 lbs. @ $6.00 a cwt.	$267.180	
To 4,450 lbs. cottonseed meal @ $30.00 a ton	66.750	
To 31,550 lbs. pea vine and Johnson grass silage @ $5.81 a ton	91.650	
To freight, commission, yardage, etc.	17.510	
Total expenditures	443.090	
By sale of five steers, 5,250 lbs. @ $7.80 a cwt.		$409.500
Total net loss		33.590
Average net loss per steer		6.718

LOT 4

To four steers, 3,765 lbs. @ $6.00 a cwt.	$225.900	
To 3,560 lbs. cottonseed meal @ $30.00 a ton	53.400	
To 25,240 lbs. silage of corn stover @ $3.93 a ton	49.600	
To freight, commission, yardage, etc.	14.008	
Total expenditures	342.908	
By sale of four steers, 4,090 lbs. @ $7.60 a cwt.		$310.840
Total net loss		32.068
Average net loss per steer		8.010

LOT 5

To five steers, 4,455 lbs. @ $6.00 a cwt.	$267.300	
To 4,450 lbs. cottonseed meal @ $30.00 a ton	66.700	
To 18,600 lbs. cottonseed hulls @ $7.00 a ton	65.100	
To freight, commission, yardage, etc.	17.510	
Total expenditures	416.660	
By sale of five steers, 5,480 lbs @ $7.85 a cwt.		$430.180
Total net profit		13.520
Average net profit per steer		2.704

1915-16

LOT 6

To ten steers, 7,911.6 lbs. @ $5.50 a cwt.	$435.138	
To 4,570 lbs. cottonseed meal @ $30.00 a ton	68.550	
To 425 lbs. corn and cob meal @ $22.85 a ton	4.845	
To 36,000 lbs. corn silage @ $3.00 a ton	54.000	
To 1,690 lbs. waste hay @ $5.00 a ton	4.225	
To freight, commission, yardage, etc.	35.160	
Total expenditures	601.918	
By sale of ten steers, 9,313 lbs. @ $7.35 a cwt.		$684.505
Total net profit		82.587
Average net profit per steer		8.258

LOT 7

To thirteen steers, 9,306.6 lbs. @ $5.50 a cwt.	$511.857	
To 5,941 lbs. cottonseed meal @ $30.00 a ton	89.150	
To 552.5 lbs. corn and cob meal @ $22.85 a ton	6.300	
To 47,499 lbs. Texas Seeded Ribbon Cane sorghum silage @ $2.61 a ton	61.990	
To 2,197 lbs. waste hay @ $5.00 a ton	5.490	
To freight, commission, yardage, etc.	45.708	
Total expenditures	720.495	
By sale of thirteen steers, 10,936.75 lbs. @ $7.35 a cwt.		$803.851
Total net profit		83.356
Average net profit per steer		6.412

LOT 8

To fifteen steers, 11,028.5 lbs. @ $5.50 a cwt.	$606.567	
To 6,855 lbs. cottonseed meal @ $30.00 a ton	102.825	
To 637.5 lbs. corn and cob meal @ $22.85 a ton	7.270	
To 55,139 lbs. corn and sorghum silage @ $3.08 a ton	82.930	
To 2,535 lbs. waste hay @ $5.00 a ton	6.340	
To freight, commission, yardage, etc.	52.740	
Total expenditures	858.672	
By sale of fifteen steers, 13,405.4 lbs. @ $7.40 a cwt.		$991.999
Total net profit		133.327
Average net profit per steer		8.888

LOT 9

To twelve steers, 8,955 lbs. @ $5.50 a cwt.	$492.525	
To 5,484 lbs. cottonseed meal @ $30.00 a ton	82.250	
To 510 lbs. of corn and cob meal @ $22.85 a ton	5.810	
To 44,460 lbs. corn and soy bean silage @ $4.14 a ton	92.030	
To 2,028 lbs. waste hay @ $5.00 a ton	5.070	
To freight, commission, yardage, etc.	42.192	
Total expenditures	719.877	
By sale of twelve steers, 11,040.54 lbs. @ $7.50 a cwt.		$829.400
Total net profit		108.143
Average net profit per steer		9.012

The financial statements for 1914-15 and 1915-16 must be considered separately for true comparisons: that is, lots 1, 2, 3, 4; and 5 are to be compared directly one with the other; and lots 6, 7, 8, and 9 are to be compared directly.

The financial statement for lots 1, 2, 3, 4, and 5 shows that the largest profit per steer was derived from lot 1, fed Goliad corn silage, which returned a profit of $12.98 per steer. The next largest profit resulted from lot 2, fed Early Amber sorghum silage, which returned a profit of $8.933 per steer. Lot 5, fed cottonseed hulls, returned a profit of $2.704

per steer. Lot 3, receiving peavine and Johnson grass silage, and lot 4, receiving corn stover silage, were both fed at a loss; lot 3 losing $6.718 per steer and lot 4 losing $8.01 per steer.

The financial statement for lots 6, 7, 8, and 9 shows that the largest profit per steer was made from lot 9, fed corn and soy bean silage, which returned a profit of $9.012 per steer. Lot 8, fed on corn and sorghum silage returned the next largest profit—$8.888 per steer. Lot 6, receiving corn silage, returned a profit of $8.258 per steer, and lot 7, receiving Texas Seeded Ribbon cane, returned a profit of $6.412 per steer.

Table V shows the return per dollar invested. The first column shows the return per dollar invested in feeds. In the cost of feeds is included interest at 8 per cent on money invested in feeds; and on money invested in steers, for 140 days for lots 1, 2, 3, 4, and 5; and for 95 days for lots 6, 7, 8, and 9. This column is meant to show the result of winter feeding to the man, with the cattle on hand, who is uncertain whether to sell the steers off grass as grass-fat cattle or to finish them in the feed lot.

The last column shows the return per dollar invested in steers and feeds, including interest on all at 8 per cent. These data are valuable to the man contemplating buying cattle in the fall to feed out in the winter that through the cattle he may be sure to market the feeds.

No charge is made in any case for labor for feeding; enough manure is produced to pay easily for such labor.

TABLE V

Lot No.	SILAGE FED	Return per dollar invested on feeds alone—interest on steers and feed @ 8%	Return per dollar invested in steers and feed interest @ 8%
	1914-15		
1	Goliad corn silage	$1.42	$1.13
2	Early Amber sorghum silage	1.26	1.08
3	Mixture, peavines and Johnson grass silage	.73	.89
4	Corn stover silage	.63	.88
5	Cottonseed hulls	1.00	1.00
	1915-16		
6	Goliad corn silage	1.39	1.12
7	Texas Seeded Ribbon cane silage	1.31	1.09
8	Mixture, Goliad corn and Early Amber sorghum silage	1.43	1.13
9	Mixture, Goliad corn and Mammoth Yellow soy bean silage	1.39	1.13

The financial results of feeding the rations used are summarized in table V. When corn and sorghum silage, corn and soy bean silage, corn silage, Early Amber sorghum silage, or Texas Seeded Ribbon Cane

silage is used for roughage, steers when fattened return more profit than when sold off grass in the fall. Cottonseed hulls is a roughage which, when sold through fattening steers, realizes about the same as when sold on the market. Cowpea and Johnson grass silage and corn stover silage are sold to fattening steers at less than the cost of production.

When one considers the return per dollar invested in feed and steers, including interest on all at 8 per cent, one sees, that neither peavine and Johnson grass silage nor corn stover silage is a profitable roughage for fattening steers; that cottonseed hulls can be fed and the feeder break even, the fertility contained in the manure as a result of the operation being sufficient to pay for the labor; that silages made from a mixture of corn and soy beans, corn and sorghum, and corn make satisfactory silages for fattening steers and are fed to about the same advantage; that Texas Seeded Ribbon Cane silage is a satisfactory silage for fattening steers, and when produced under the conditions outlined returns about 4 per cent less on the total investment than corn silage; that Early Amber sorghum silage is a satisfactory silage for fattening steers, and when produced under the conditions outlined returns 5 per cent less on the total investment than corn silage made from Goliad corn.

PART II

RELATION OF NUTRIENTS CONTAINED IN FEEDS TO BEEF PRODUCED

The results of the experiments outlined in the first part of this bulletin become much more intelligible after the reader has had an opportunity to correlate the nutrients furnished by each ration with the gains made by the steers being fed on the various rations.

One of the fundamental principles of livestock husbandry is this: It does not pay to board an animal of any kind. Any animal to be handled with profit must be a producer. In the case of the steer, the profit must come from the increase he makes over his original value plus the value of the feed stuffs he eats. Normally such an increase in value must come from an increase in body weight. To gain in weight a steer must receive more nourishment than is required for the maintenance of the body. The daily gains made by a fattening steer are therefore proportionate to the digestible nutrient consumed daily over and above that required for maintenance of the body. As the capacity of a steer admits of his consuming daily only a limited volume of feed, the problem of fattening a steer profitably is that of furnishing a ration which in volume contains the maximum amount of nourishment, or digestible nutrients, at the minimum cost.

The Department of Chemistry of the Mississippi A. and M. College has kindly analyzed the feeds used in the experiments, as shown in table VI.

TABLE VI
Chemical Analysis of Feeds

FEED	Moisture	Ash	Fat	Protein	Nitrogen Free Extract	Fibre	Total Dry Matter
nseed meal, (Fed Lots 1, 2, 3, 4, 5)	7.65	6.25	6.98	36.44	27.38	15.30	92.35
nseed meal, (Fed Lots 6, 7, 8, 9)	8.53	6.25	7.00	39.00	26.57	12.65	91.47
and cob meal, (Fed Lots 6, 7, 8, 9)	12.84	2.33	4.31	9.25	64.97	6.30	87.16
d corn silage, (Fed Lot 1)	68.50	1.68	.96	3.06	17.32	8.48	31.50
Amber sorghum silage, (Fed Lot 2)	73.34	1.30	1.09	1.14	13.87	9.26	26.66
ines and Johnson grass silage, (Fed Lot 3)	70.59	3.29	1.38	3.85	12.03	8.86	29.41
d corn stover, (Fed Lot 4)	76.14	.93	.57	1.16	11.27	9.93	23.86
nseed hulls, (Fed Lot 5)	9.27	2.50	.98	3.25	38.45	45.55	90.73
d corn silage, (Fed Lot 6)	71.18	1.40	.51	2.40	16.70	7.81	28.82
s Seeded Ribbon cane silage, (Fed Lot 7)	75.62	1.85	.56	1.62	13.75	6.60	23.38
Amber sorghum and Goliad corn silage, (Fed Lot 8)	74.40	2.37	.47	1.79	13.90	7.07	25.60
d corn and Mammoth Yellow soy beans, (Fed Lot 9)	67.55	7.03	1.34	3.56	12.45	8.07	32.45
e hay, (Fed Lots 6, 7, 8, 9)	9.80	4.60	1.36	4.18	44.34	35.72	90.20

By means of the analysis shown in table VI, the total nutrients consumed per pound of gain are found. These are shown in table VII.

TABLE VII

Nutrients Consumed per Pound of Gain

Lot No.	Feeds Consumed per Pound of Gain — FEED	Lbs.	Moist're Lbs.	Ash Lbs.	Fat Lbs.	Prot'n Lbs.	Nit'gn Free Ext'ct Lbs.	Fibre Lbs.	Total Dry Matt'r Lbs.
1	Cottonseed meal	3.65	.2792	.228	.255	1.330	.999	.558	3.370
	Goliad corn silage	25.88	17.727	.435	.248	.792	4.483	2.193	8.151
	Total	29.53	18.006	.663	.503	2.122	5.482	2.751	11.521
2	Cottonseed meal	4.10	.314	.257	.287	1.496	1.124	.628	3.792
	Early Amber sorghum silage	29.10	21.346	.378	.317	.332	4.037	2.690	7.754
	Total	33.20	21.660	.635	.604	1.828	5.161	3.318	11.546
3	Cottonseed meal	4.95	.379	.309	.346	1.804	1.346	.757	4.562
	Cowpea and Johnson grass silage	35.09	24.884	1.155	.485	1.351	4.222	3.109	10.322
	Total	40.04	25.263	1.464	.831	3.155	5.568	3.866	14.884
4	Cottonseed meal	9.97	.763	.623	.696	3.634	2.730	1.526	9.209
	Corn stover silage	70.70	53.834	.668	.403	.820	7.968	7.020	16.879
	Total	80.67	54.597	1.291	1.099	4.454	10.698	8.546	26.088
5	Cottonseed meal	4.10	.314	.257	.287	1.496	1.124	.628	3.792
	Cottonseed hulls	17.16	1.590	.429	.168	.558	6.598	7.816	15.569
	Total	21.26	1.904	.686	.455	2.054	7.722	8.444	19.361
6	Cottonseed meal	3.26	.278	.204	.228	1.272	.866	.413	2.983
	Corn and cob meal	.303	.039	.007	.020	.028	.197	.019	.271
	Goliad corn silage	25.68	18.280	.360	.130	.620	4.290	2.000	7.400
	Waste hay	1.20	.118	.055	.016	.050	.534	.430	1.085
	Total	30.443	18.715	.626	.394	1.970	5.887	2.862	11.739
7	Cottonseed meal	3.61	.311	.228	.255	1.424	.968	.461	3.336
	Corn and cob meal	.339	.044	.008	.015	.031	.220	.021	.295
	Texas Seeded Ribbon cane silage	29.13	22.030	.540	.160	.470	4.000	1.920	7.090
	Waste hay	1.34	.132	.061	.018	.056	.596	.481	1.212
	Total	35.419	22.517	.837	.448	1.981	5.784	2.883	11.933
8	Cottonseed meal	2.88	.241	.180	.202	1.125	.766	.365	2.638
	Corn and cob meal	.268	.034	.006	.012	.025	.175	.017	.235
	Equal parts Goliad corn and Tex. Seeded Ribbon cane silage	23.19	17.250	.540	.100	.410	3.220	1.640	5.910
	Waste hay	1.06	.105	.049	.015	.045	.472	.380	.961
	Total	27.398	17.630	.775	.329	1.605	4.633	2.402	9.744
9	Cottonseed meal	2.62	.224	.164	.184	1.026	.699	.333	2.406
	Corn and cob meal	.244	.031	.006	.011	.023	.159	.016	.215
	Equal parts Goliad corn & Mammoth Yellow soy bean silage	21.31	14.400	1.490	.280	.750	2.650	1.720	6.890
	Waste hay	.972	.095	.044	.013	.041	.431	.347	.876
	Total	25.146	14.750	1.704	.488	1.840	3.939	2.416	10.387

Table VIII shows the average digestibility of the nutrients contained in the feeds used, as given by Henry and Morrison in "Feeds and Feeding," 1915 edition, table II, appendix.

TABLE VIII

Average Percentage Digestibility of Feeding Stuffs.

FEED	Crude protein	Fibre	Nitrogen free extract	Fat
Cottonseed meal, choice and prime	.84	.37	.75	.95
Corn and cob meal	.52	.45	.88	.84
Corn silage, dent, mature	.51	.65	.71	.82
Sorghum silage, well matured	.....	.58	.64	.56
Corn and sorghum silage	.63	.62	.77	.83
Cowpea silage	.57	.52	.73	.63
Timothy, fresh green	.48	.56	.66	.53
Johnson grass hay	.44	.67	.57	.46
Cottonseed hulls	.6	.47	.34	.79

uirements"

ot o.	Number of steers in lot	Initial weight of lot—pounds	Total consumed Dry matter pounds	Digestible nutrients consumed per pound gain above maintenance requirements.			Total dry matter consumed per lb. of gain above maintenance requirements pounds
				Protein pounds	Fat pounds	Nitrogen free extract and fibre pounds	
1	5	4439	14047.82 10946.54 3161.28	1.227	.346	1.536	2.626
2	5	4515	12520.80 11133.99 1386.81	1.066	.336	1.410	1.279
3	5	4453	13388.43 10981.10 2407.33	1.831	.474	1.398	2.678
4	4	3765	9309.90 9284.49 25.41	2.503	.622	2.295	.071
5	5	4455	20985.35 10986.03 9999.32	.948	.292	3.231	9.224
6	10	7911.6	16450.15 13101.61 3348.54	1.113	.239	2.523	2.389
7	13	9306.6	19477.70 15411.73 4065.97	1.133	.249	1.934	2.494
8	15	11028.5	23228.03 18262.92 4965.11	.924	.114	1.753	2.090
9	12	8955	21717.23 14829.48 6887.75	1.136	.348	1.740	3.303

From this table it is p wpea and Johnson grass silage and corn stover silage
due to the fact that y each lot of steers were directly proportionate to the
stible nutrients consur n for fattening steers is directly proportionate to the
stible nutrients contai

"Table IX, Showing Digestible Nutrient Requirements"

Lot No.	Number of steers in lot	Initial weight of lot—pounds	SILAGE FED	Duration of feeding period	Gain for lot in pounds	DIGESTIBLE NUTRIENTS	Protein pounds	Fat pounds	Nitrogen free extract and fibre pounds	Total consumed Dry matter pounds	Digestible nutrients consumed per pound gain above maintenance requirements. Protein pounds	Fat pounds	Nitrogen free extract and fibre pounds	Total dry matter consumed per lb. of gain above maintenance requirements pounds
1	5	4439	Goliad corn silage	137 days	1219	Actually consumed	1854.50	543 44	5934.36	14047.82	1.227	.346	1.536	2.626
						Maintenance requirement	358.80	121 63	4062.40	10946.54				
						Difference	1495.70	421.81	1871.96	3161.28				
2	5	4515	Early Amber sorghum silage	137 days	1084	Actually consumed	1520.38	487.66	5660.83	12520.80	1.066	.336	1 410	1.279
						Maintenance requirement	364.95	123.71	4131.95	11133.99				
						Difference	1155.43	363.95	1528.88	1386 81				
3	5	4453	Cowpea and Johnson grass silage	137 days	899	Actually consumed	2005 91	547 95	5332.01	13388.43	1.831	.474	1.398	2.678
						Maintenance requirement	359.94	122 01	4075.21	10981.10				
						Difference	1645.97	425.94	1256.80	2407.33				
4	4	3765	Corn stover silage	137 days	357	Actually consumed	1198 03	325 25	4265 03	9309.90	2 503	.622	2.295	.071
						Maintenance requirement	304 32	103.16	3445.58	9284.49				
						Difference	893 71	222.09	819.45	25.41				
5	5	4455	Cottonseed hulls	137 days	1084	Actually consumed	1398.40	439 08	7579 27	20985.35	.948	.292	3.231	9.224
						Maintenance requirement	360 10	122.07	4077.04	10986 03				
						Difference	1038.30	317.01	3502.23	9999 32				
6	10	7911.6	Goliad corn silage	92 days	1401 4	Actually consumed	1989.29	480 41	8398.27	16450.15	1.113	.239	2.523	2.389
						Maintenance requirement	429.44	145.57	4862.20	13101.61				
						Difference	1559.85	334.84	3536.07	3348.54				
7	12	9306 6	Texas Seeded Ribbon cane silage	92 days	1630.15	Actually consumed	2351 82	577 77	8872.74	19477.70	1.133	.249	1.934	2.494
						Maintenance requirement	505.16	171 24	5719.64	15411.73				
						Difference	1846.66	406.53	3153.10	4065.97				
8	10	11028.5	Mixture Goliad corn and Early Amber sorghum silage	92 days	2376.9	Actually consumed	2796.74	483.60	10945.51	23228.03	.924	114	1.753	2.090
						Maintenance requirement	598.92	203.32	6777.64	18262.92				
						Difference	2197.82	280.28	4167.87	4965.11				
9	12	8955	Mixture Goliad corn and Mammoth yellow soy bean silage	92 days	2085.54	Actually consumed	2855.54	890.31	9140.04	21717.23	1.136	.348	1.740	3.303
						Maintenance requirement	486.08	164.77	5511.72	14829.48				
						Difference	2369.46	725.54	3628.32	6887 75				

From this table it is plain that the very poor and unprofitable gains made by the lots of steers (lots 3 and 4) receiving cowpea and Johnson grass silage and corn stover silage are due to the fact that each lot received but little more than a maintenance ration, it is also plain that the gains made by each lot of steers were directly proportionate to the digestible nutrients consumed over and above that required for maintenance and it is evident that the efficiency of a ration for fattening steers is directly proportionate to the digestible nutrients contained in the ration.

No coefficients of digestibility are given for a silage mixture of cowpeas and Johnson grass or for a silage mixture of corn and sorghum. Since Johnson grass has practically the same feeding value as timothy, the average of the coefficients of fresh green timothy and cowpea silage was used as the nearest estimate possible. For a silage mixture of corn and soy beans the average of the coefficients of corn silage and soy bean silage was used. The following were the coefficients of digestibility used for the two silages not given:

FEED	Crude protein	Fibre	Nitrogen free extract	Fat
Cowpea and Johnson grass silage	.53	.54	.69	.58
Corn and soy bean silage	.48	.62	.68	.69

On pages 245 and 246 of "The Scientific Feeding of Animals," Kellner shows that for mature oxen at rest an average of .59 pounds of digestible protein, .20 pounds of digestible fat, and 6.68 pounds of digestible nitrogen free extract and crude fibre, and an average of 18 pounds of total dry matter are daily required per 1000 pounds live weight as a maintenance ration.

Using Kellner's estimate of a maintenance ration and the coefficients of digestibility drawn from Henry and Morrison's tables, it is then possible to construct table IX, which shows the total digestible nutrients consumed, the digestible nutrients required for each lot for maintenance for the time fed, and the digestible nutrients required per pound of gain from each ration over and above that required for maintenance.

Attention is called to the column showing total dry matter consumed per pound of gain over and above that required for maintenance. A daily average of 18 pounds per 1000 pounds live weight is given by Kellner as the dry matter required for maintenance. Without doubt, the quantity of dry matter required for maintenance may vary widely especially with such feeds as silage. By considering the maintenance requirements of dry matter used to be too large, we may explain the apparent error of showing the total dry matter consumed per pound of gain above that required for maintenance to be less than the sum of digestible nutrients consumed per pound of gain above that required for maintenance. The comparison, however, of one ration with another is still a true comparison.

Bulletin No. 183 September, 1917

Baby Beef and Calf Feeding

By H. K. GAYLE

ON WINTER PASTURE

Crimson clover furnishes an ideal late winter pasture for growing calves.

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

There is at present a world shortage of meat animals, and the producers of beef cattle are thereby enjoying unprecedented prosperity.

The only section of the United States that can practically and profitably increase to any considerable extent its production of beef cattle is the South East. In this section the mild climate, cheap lands and good grass offers rare opportunities to those engaged in beef cattle production.

The practice of fat calf and baby beef production affords a method of placing good beef on the market in a short time, and is profitable under a system of intensive farming when high grade cattle are used.

E. R. LLOYD, Director.

Baby Beef and Calf Feeding

By H. K. Gayle

This bulletin describes two experiments conducted by the Mississippi Experiment Station at the Agricultural and Mechanical College, and two experiments conducted by the Division of Animal Husbandry, Bureau of Animal Industry of the United States Department of Agriculture, co-operating with the Mississippi Experiment Station. The co-operative experiments, by the Bureau, were conducted on the farm of Mr. Ben Walker, near West Point, Mississippi, on land typical of the black prairie section of Mississippi. All experiments are concerned with the fattening of calves for market under Mississippi conditions.

CONCLUSIONS

The practice of feeding out calves to be sold as fat calves or as baby beef has been increasing in the past few years. Calves not only make more economical use of their feed than the mature steers, but when sent to market in prime condition usually return, after an investment of but two years standing, a profit practically equal to that which is returned by steers after an investment of from three to five years, when the animals are raised by the feeder. Furthermore, the consumer is now demanding a comparatively small cut of meat of high quality.

When the surplus cattle are marketed as calves every year, it is possible to maintain a larger breeding herd on the same acreage than when the increase is grown out to mature steers. It is also possible to market heifers to the same advantage as steers, if they are sold as fat calves or baby beef.

The production of baby beeves or fat calves is best suited to a system of intensive farming. The proportion of concentrate to roughage required is greater in fattening calves for the market than in growing them into mature steers. The growing calf, admirably adapted to the utilization of roughage, can be carried through the first and second winters on cheap hays, silage, and stovers, with a very little high priced concentrate feed being fed. The fattening calf must, however, have an abundance of concentrated feeds, otherwise it will grow rather than fatten.

The farm that is made up largely of broken and semi-waste pasture lands is probably better adapted to the production of stocker and feeder cattle, with the minimum number being finished in the feed lot, than to the production of prime baby beef or fat calves.

For the production of calves that will give a good account of themselves in the feed lot, a herd of cows carrying several crosses of good beef blood is necessary. They must be mated to a heavily fleshed, blocky, beef bull of early maturing propensities. The rangy bull, rough in conformation, cannot be expected to sire a calf that will take on fat and finish smoothly as a yearling.

Prime baby beef can be produced profitably under Mississippi conditions. Late summer and fall calves can be carried through the winter at teat, pastured the following summer and fed the next winter at a tidy profit. Even those calves which are of fair to good quality, although unsuited for the production of prime beef, can be fattened at a good profit.

Summary

PART 1

Experiments by Mississippi Experiment Station.

EXPERIMENT 1—PRIME BABY BEEF, 1915-16

1. The objects of this experiment were: first, to determine if strictly prime baby beef could be produced profitably under Mississippi conditions; and second, to make a comparison of concentrate rations containing different proportions of chopped corn, corn and cob meal, oats, and cottonseed meal, for finishing calves in the dry lot, when fed with corn silage and Johnson grass hay and roughage.

2. The calves used were good grades, sired by registered beef bulls and out of good grade shorthorn cows. They were about 7 months old when first put on feed and 8½ months old when weaned and put on full feed. When sold they averaged fourteen months. When first started on feed the calves averaged 437.43 pounds in weight and were worth $6 a hundred weight.

3. The average daily ration per calf while weaning was:

Bran	1 pound
Corn and Cob Meal	1.62 pound
Oats	1.62 pound
Cottonseed Meal	.13 pound

In addition they were given pasture and were allowed to suck their dams. During the 41-day weaning period the calves made an average daily gain of 1.5 pound per calf at a cost of $6.22 per 100 pounds of gain.

4. The average daily ration per calf while on full feed was:

Lot I—

Corn Chops	3.14 lbs.
Oats	3.14 lbs.
Cottonseed Meal	1.57 lbs.
Corn Silage	18. lbs.
Johnson grass hay	2.56 lbs.

Lot II—

Corn chops	3.59 lbs.
Cottonseed meal	3.59 lbs.
Corn silage	22.7 lbs.
Johnson grass hay	2.5 lbs.

Lot III—

Corn and Cob meal	1.89 lbs.
Cottonseed meal	3.79 lbs.
Corn silage	24.2 lbs.
Johnson grass hay	2.5 lbs.

Lot IV—

Corn and Cob meal	1.75 lbs.
Oats	1.75 lbs.
Cottonseed meal	3.51 lbs.
Corn silage	18.65 lbs.
Johnson grass hay	2.5 lbs.

Lot V—

Cottonseed meal	4.07 lbs.
Corn silage	22.1 lbs.
Johnson grass hay	2.54 lbs.

5. During the test period of 167 days the calves made a daily gain of 1.33, 1.41, 1.27, 1.4, and 1.32 pounds per calf for Lots I, II, III, IV, and V respectively.

6. The cost of making 100 pounds of gain was $12.14, $10.93, $10.04, $10.29, and $8.08 for each of the five lots during the test

period. The profit per calf was $ .35, $7.16, $12.08, $3.95, and $8.64 for Lots I, II, III, IV, and V respectively.

7. The calves dressed out 58.30, 58.01, 57.49, 57.21, and 56.70 per cent. of their market weights, indicating that the rations containing the larger proportion of corn produced fatter carcasses than those containing chiefly cottonseed meal.

EXPERIMENT 2—FATTENING LATE CALVES, 1914-15

1. The objects of this experiment were, first, to determine if late summer and early fall calves and calves of such breeding as would make them unfit for the production of prime baby beef could be fattened profitably as yearlings; second, to make a comparison of cottonseed meal and cold pressed cake as a concentrate for fattening calves; and third, to make a comparison of corn silage and cottonseed hulls as a roughage for fattening calves.

2. The calves used were a fairly well bred lot of mixed Angus, Hereford, and Shorthorn, steer and heifer calves, averaging 505.56 pounds when put on feed at from 10 to 14 months of age, and valued at $6 a hundredweight.

3. The calves were fed from December 1, 1914, to April 16, 1915, a period of 137 days. They were divided into five lots and received per calf the following average daily rations:

Lot I—

Cottonseed meal	2.71 lbs.
Corn and cob meal	4. lbs.
Corn silage	22.55 lbs.

Lot II—

Cold pressed cake	4.05 lbs.
Corn and cob meal	4. lbs.
Corn silage	22.55 lbs.

Lot III—

Cottonseed meal	2.97 lbs.
Corn and cob meal	4. lbs.
Corn silage	17.6 lbs.
Johnson grass hay	5. lbs.

Lot IV—

Cold pressed cake	4.45 lbs.
Corn and cob meal	4. lbs.
Corn silage	17.6 lbs.
Johnson grass hay	5. lbs.

Lot V—

Cottonseed meal	2.7 lbs.
Corn and cob meal	4. lbs.
Cottonseed hulls	13.76 lbs.

4. During the test period of 137 days the calves made an average daily gain of 1.39, 1.58, 1.55, 1.67, and 1.32 pounds per calf for Lots I, II, III, IV, and V respectively.

5. Comparison between Lots I and II showed 1 pound of cottonseed meal to have the same feeding value as 1.29 pounds of cold pressed cake. Comparison between Lots III and IV showed 1 pound of cottonseed meal to have the same feeding value as 1.45 pounds of cold pressed cake. Comparison between Lots I and V showed 1 pound of cottonseed hulls to be equal in feeding value to 1.56 pounds of corn silage.

6. The cost of producing 100 pounds of gain was $7.68, $7.13, $8.23, $8.29, and $8.63 for each of the five lots respectively.

7. The profit per calf from each respective lot was $7.82, $9.18, $6.84, $6.67, and $6.00, showing that fair to good yearlings can be fed profitably although strictly prime beef is not produced.

PART II

EXPERIMENTS BY THE BUREAU OF ANIMAL INDUSTRY

The work recorded in the following section was done by the Division of Animal Husbandry of the Bureau of Animal Industry, U. S. Department of Agriculture, co-operating with the Mississippi Experiment Station; the experiments were made on the farm of Mr. Ben Walker near West Point, Mississippi.

EXPERIMENT 1—FATTENING CALVES, 1914-15

1. The object of this test was to get further information concerning the use of cottonseed meal and mixtures of cottonseed meal and corn for finishing calves for the market.

2. The average initial weights of the calves used in the tests were: Lot I, 437; Lot II, 427; and Lot III, 436 pounds. The final weights were: Lot I, 682; Lot II, 695; and Lot III, 663 pounds. The average daily gains per calf were: Lot I, 1.71 pounds; Lot II, 1.87 pounds; and Lot III, 1.59 pounds.

3. All lots received corn silage, alfalfa hay, and cottonseed hulls as roughage. Lot I consumed 214 pounds of cottonseed meal for each 100 pounds of gain; Lot II consumed 172 pounds of cottonseed meal and 86 pounds of corn and cob meal per 100 pounds of gain; Lot III consumed 112 pounds of cottonseed meal and 225 pounds of corn and cob meal for each 100 pounds of gain.

4. The costs per 100 pounds of gain were as follows: Lot I, $6.34; Lot II, $6.34; and Lot III, $7.40. The calves of all lots made gains very cheaply.

5. The amount of roughage required to make 100 pounds of gain was greatest with Lot I and smallest with Lot II.

6. The average profit per head for each of the lots was as follows: Lot I, $5.67; Lot II, $2.98; and Lot III, $3.56.

7. The shrinkage of Lots I, II, and III was 36, 57, and 29 pounds per calf respectively. The heavy shrinkage of Lot II cannot be explained.

8. By market weights the calves dressed out as follows: Lot I, 54.85 per cent; Lot II, 54.05 per cent; Lot III, 53.87 per cent.

9. Since no pigs followed the calves of Lots II and III, it did not pay so well to feed a mixture of cottonseed meal and corn and cob meal, as to feed cottonseed meal as the sole concentrate.

EXPERIMENT 2—HEAVY GRAIN RATION FOR FATTENING CALVES, 1915-16

1. The objects of this test were, first, to see if the feeding of heavy grain rations to calves until they were well finished would be profitable; second, to make a comparative study of the value of cottonseed meal alone, a combination of cottonseed meal and shelled corn, and shelled corn alone, to be fed with a ration of silage with a

small allowance of alfalfa hay; and, third, to determine approximately how much manure can be saved by feeding calves on a concrete floor.

2. The calves were good grades, having from two to three crosses of beef blood on original scrub stock. They were from 6 to 8 months of age and weighed 271, 265, and 280 pounds per calf for Lots I, II, and III respectively at weaning time, when the experiment began.

3. When on full feed the calves were eating the following ration per head per day:

Lot I—

Cottonseed meal	5. lbs.
Corn silage	26.7 lbs.
Alfalfa hay	4.0 lbs.

Lot II—

Cottonseed meal	2.0 lbs.
Shelled corn	8.0 lbs.
Corn silage	18.6 lbs.
Alfalfa hay	4.0 lbs.

Lot III—

Shelled corn	12.0 lbs.
Corn silage	13.3 lbs.
Alfalfa hay	4.0 lbs.

The calves that consumed a heavy grain ration consumed a smaller silage ration and those that ate a heavy silage ration ate a small grain ration.

4. The calves were fed for 156 days. They made a daily gain of 1.74, 1.7, and 1.8 pounds per calf for Lots I, II, and III respectively. This is a good gain for calves for a long feeding period.

5. The cost of making 100 pounds of gain for each of the three lots was $8.17, $8.58, and $8.66 respectively.

6. When no pork credit is allowed the calves of Lots II and III, the average profit per head was: Lot I, $10.48; Lot II, $8.57; and Lot III, $8.68. It is estimated that the pork produced was worth about $3.00 per calf, which would make the feeding of corn slightly more profitable than feeding cottonseed meal alone.

7. The calves of Lots I, II, and III produced 29.2, 26.2, and 21.3 pounds of manure per head per day. No bedding was used and the manure was scraped up and weighed daily. Some of the liquid was lost.

8. In shipping, the calves of Lots I, II, and III shrank 48, 29, and 36 pounds respectively, or 6.8 per cent, 4.2 per cent, and 5.0 per cent of their live weight.

9. The calves dressed out 54.4, 56 and 55.9 per cent. of marketable meat. These percentages indicate that there was practically no difference in the fatness of the calves of Lots II and III, but both lots were much fatter than the calves of Lot I.

Detailed Description of Experiments

Part I

OBJECTS OF THE EXPERIMENTS

The objects of the experiments recorded are:

1 To determine if strictly prime baby beef could be produced profitably under Mississippi conditions.
2 To determine if the class of calves unfit for the production of prime baby beef could be fattened profitably and marketed as yearlings.
3 To get information on the most economical available feeds for finishing calves.
4 To find out to what particular system of farming in the South fat calf and baby beef production economically belongs.

Experiments by the Mississippi Experiment Station

EXPERIMENT 1—PRIME BABY BEEF, Winter 1915-16

Cottonseed Meal, Corn and Cob Meal, Corn Chops, Oats, Corn Silage, and Johnson Grass Hay for the feeding of prime baby beef.

CALVES USED

The calves used in this experiment were grade Angus, Hereford, and Shorthorn. They were out of good grade Shorthorn cows representing three to four crosses of beef blood on native stock and were all sired by registered bulls. In quality these calves were unusually good and would have sold as choice stockers.

FEED LOTS AND WATER SUPPLY

All calves were fed in a shed open on the East and South. They did not have the run of open lots but were confined to pens allowing about 60 square feet of floor space to each calf. The pens were kept well bedded at all times. Water was supplied from a deep well, to each pen. Feeding was done at 6:30 o'clock in the morning and at 3:30 o'clock in the afternoon.

CHARACTER AND PRICE OF THE FEEDS

The feeds used were all raised on the Station farm, except the small amount of bran used while weaning the calves, and the cottonseed meal, both of which were bought on the open market.

The cottonseed meal, which was of good quality, tested 7½ per cent nitrogen. The corn, also of good quality, shelled out 85 per cent. The oats were clean and sound. The silage made from

Goliad corn which cut at the rate of about 10 tons green silage an acre, was of good quality and free from mold. The Johnson grass hay was hardly average, as it was a little coarse and stemmy.

The feeds used were valued as follows:

Cottonseed meal	$30.00 a ton
Bran	28.00 a ton
Corn and cob meal	.80 a bu.
Corn chops	.80 a bu.
Oats	.55 a bu.
Corn silage	3.00 a ton
Johnson grass hay	10.00 a ton

AVERAGE DAILY RATION

One of the first essentials to the successful finishing of calves in the feed lot is that the calf must never be allowed to lose its calf fat. The weaning, therefore, must be done gradually, so that the calf may receive no set back. Once a calf loses its bloom or calf fat it is practically impossible to finish it as prime beef before it is two years old, as the tendency is then to grow rather than to fatten.

To avoid this the calves of all lots in this experiment were brought up from pasture with their dams on October 10, when pastures were getting short and dry. Between October 10 and November 16 they were given a preliminary feeding period. During the first part of the preliminary period they were allowed to suck their dams twice daily; during the latter part of the period only once a day. On November 1 they were divided into their test lots: then for the next two weeks they were allowed to suck their dams only once every other day: and after that they were gradually put exclusively on the rations used for the respective tests. The calves were not started on full feed until November 16.

During the first part of the preliminary feeding period all calves were given all they would clean up of grain mixture of equal parts corn and cob meal, bran, and oats. A little cottonseed meal was added later on. They were run with their dams on pasture and given no additional roughage.

Table I shows the average daily ration per calf during the preliminary period of 41 days.

TABLE I
AVERAGE DAILY RATION—PRELIMINARY PERIOD
OCTOBER 10 TO NOVEMBER 16—41 DAYS

FEED	Lot I 5 calves	Lot II 5 calves	Lot III 5 calves	Lot IV 5 calves	Lot V 5 calves
Pasture and milk					
Bran	1.	1.	1.	1.	1.
Corn and cob meal	1.62	1.62	1.64	1.64	1.62
Oats	1.66	1.62	1.62	1.64	1.62
Cottonseed meal	.11	.13	.13	.13	.13
Corn Chops	.04	.04			

WEIGHTS AND GAINS, PRELIMINARY PERIOD

As stated previously, the object of feeding the calves for the 41 days before starting the test was, to get the calves accustomed to eating grain and to keep them gaining during the weaning process. For this reason they were given rather the most palatable ration than the cheapest.

Table II shows the average initial weight per calf in each lot at the time they were first put on feed, the average weight per calf in each lot at the conclusion of the preliminary period, and the gains made during the weaning process.

TABLE II
WEIGHTS AND GAINS—PRELIMINARY PERIOD
OCTOBER 10 TO NOVEMBER 16—41 DAYS

LOT	Average initial weight per calf	Average final weight per calf	Average total gain per calf	Average daily gain per calf
I	391.23 lbs.	449 66 lbs.	58.43 lbs.	1.42 lbs.
II	458.06 lbs.	521.83 lbs.	62.77 lbs.	1.5 lbs.
III	503.14 lbs.	565.33 lbs.	62.19 lbs.	1.51 lbs.
IV	404.52 lbs.	464.2 lbs.	59.68 lbs.	1.46 lbs.
V	430.2 lbs.	500 3 lbs.	70.1 lbs.	1.71 lbs.

As the table shows, the calves kept gaining at a good rate while being weaned. When weaned, they were in condition to go on to their test rations uniformly. The gains made during the preliminary period were fairly uniform for all lots, as would be expected, as they were all under the same conditions and on the same rations until the latter part of the period. Lot V made a slightly larger gain than either of the other lots. The reason for the difference is not known.

QUANTITY AND COST OF FEEDS REQUIRED TO MAKE 100 POUNDS OF GAIN. PRELIMINARY PERIOD

Table III shows the quantity and cost of feeds required to make 100 pounds of gain during the 41 day weaning period. Aside from the grain rations consumed the calves and their dams were charged for pasturage at the rate of 50 cents a head per month, the pasture for the cow being charged against the calf in payment of the milk consumed.

TABLE III
QUANTITY AND COST OF FEED REQUIRED TO MAKE 100 POUNDS OF GAIN—PRELIMINARY PERIOD
OCTOBER 10 TO NOVEMBER 16—41 DAYS

FEED	Lot I.	Lot II	Lot III	Lot IV	Lot V
Bran	68.22 lbs.	64.96 lbs.	64.58 lbs.	67.12 lbs	57.18 lbs.
Corn and cob meal	110.73 lbs.	104.89 lbs.	105.68 lbs.	110 07 lbs.	92 35 lbs.
Corn chops	2 73 lbs.	2.59 lbs.			
Oats	113.54 lbs.	104.97 lbs.	104 24 lbs.	110.14 lbs.	92.41 lbs.
Cottonseed meal	7.43 lbs.	8 34 lbs.	8.7 lbs.	9.29 lbs.	7.91 lbs.
Cost of pasture	$2.54	$2.10	$2.19	$2.28	$1.97
Total cost per 100 lbs. gain	$6.64	$6.25	$6.22	$6.48	$5.49

The foregoing table shows that surprisingly cheap gains were made by all calves, much cheaper, in fact, than would be expected of calves in the feedlot for a long period. The gains were also cheaper than could be expected of calves weaned without pasture, and milk from their dams.

AVERAGE DAILY RATION. EXPERIMENTAL PERIOD

During the experimental period of 167 days no sub-periods were used. It was thought best to make increases in the rations fed whenever the appetites of the calves would permit, rather than to use arbitrary periods. In this way it was possible to keep the calves on the maximum ration at all times.

The grain and the silage were fed separately. The calves were given all the grain they could clean up within one hour after feeding and all the silage they could clean up within three hours after feeding.

Table IV shows the average daily ration per calf when started on the experimental period, November 16: the average daily ration being consumed per calf at the end of the period, April 30, and the average daily ration per calf for the entire period:

TABLE IV
AVERAGE DAILY RATION
NOVEMBER 16 TO APRIL 30—167 DAYS

LOT	FEED	At Beginning of Test	At End of Test	Av. for Test period, 167 days
I	Corn chops.....2 parts	1.6 lbs.	4.8 lbs.	3.14 lbs.
	Oats .....2 parts	1.6 lbs.	4.8 lbs.	3.14 lbs.
	Cottonseed meal.....1 part	.8 lbs.	2.4 lbs.	1.57 lbs.
	Corn Silage	10. lbs.	18. lbs.	18. lbs.
	Johnson Grass Hay.....	5. lbs.	2. lbs.	2.56 lbs.
II	Corn chops .....1 part	1.7 lbs.	5. lbs.	3.59 lbs.
	Cottonseed meal.....1 part	1.7 lbs.	5. lbs.	3.59 lbs.
	Corn Silage	10. lbs.	20. lbs.	22.7 lbs.
	Johnson Grass Hay.....	5. lbs.	2. lbs.	2.5 lbs.
III	Corn and cob meal.....1 part	.93 lbs.	2.5 lbs.	1.89 lbs.
	Cottonseed meal .....2 parts	1.87 lbs.	5. lbs.	3.79 lbs.
	Corn Silage	10. lbs.	24. lbs.	24.2 lbs.
	Johnson Grass Hay.....	5. lbs.	2. lbs.	2.5 lbs.
IV	Corn and cob meal.....1 part	1. lbs.	2.5 lbs.	1.75 lbs.
	Oats .....1 part	1. lbs.	2.5 lbs.	1.75 lbs.
	Cottonseed meal .....2 parts	2. lbs.	5. lbs.	3.51 lbs.
	Corn Silage	10. lbs.	18. lbs.	18.65 lbs.
	Johnson Grass Hay.....	5. lbs.	2. lbs.	2.5 lbs.
V	Cottonseed meal	2. lbs.	5. lbs.	4.07 lbs.
	Corn Silage	10. lbs.	24. lbs.	22.1 lbs.
	Johnson Grass Hay.....	5. lbs.	2. lbs.	2.54 lbs.

The calves were started on a rather light grain ration, then the silage was increased as rapidly as they would take it, and the grain was increased a little. Toward the latter part of the period, the grain was increased and the silage and hay were decreased.

WEIGHTS AND GAINS

The calves were weighed individually for three consecutive days both at the beginning of the preliminary period and at the beginning of the test period. The average of three weighings was taken as their weight on the second day. Throughout the experiment they were weighed as lots every two weeks. At the conclusion of the experiment they were weighed individually again. All weighings were done at about 10 o'clock in the morning, after the calves had been fed, but had been given no water since the night before.

Table V shows the average weight per calf of each lot at the beginning of the test period, the final weight per calf, and the gains made.

TABLE V
WEIGHTS AND GAINS
NOVEMBER 16 TO APRIL 30—167 DAYS

LOT	RATION	Average Initial Wt. per Calf	Average Final Wt. per Calf	Average Total Gain per Calf	Average Daily Gain per Calf
I	Corn chops.....2 parts Oats .....2 parts Cottonseed meal.....1 part Corn silage ..... Johnson grass hay.....	449.66 lbs.	671. lbs.	221.34 lbs.	1.33 lbs.
II	Corn chops.....1 part Cottonseed meal.....1 part Corn silage ..... Johnson grass hay.....	521.83 lbs.	751. lbs.	239.17 lbs.	1.41 lbs.
III	Corn & cob meal.....1 part Cottonseed meal.....2 parts Corn silage ..... Johnson grass hay.....	565.33 lbs.	776.8 lbs.	211.47 lbs.	1.27 lbs.
IV	Corn & cob meal.....1 part Cottonseed meal.....2 parts Oats .....1 part Corn silage ..... Johnson grass hay.....	464.2 lbs.	697. lbs.	232.8 lbs.	1.4 lbs.
V	Cottonseed meal ..... Corn silage ..... Johnson grass hay.....	500.3 lbs.	721.4 lbs.	221.1 lbs.	1.32 lbs.

The preceding table shows that very satisfactory gains were made by all calves. It is interesting to note, however, that Lot II, which received a grain ration of equal parts chopped corn and cottonseed meal made larger gains than any of the other lots. The next largest gains were made by Lot IV which received a grain ration made up of one-half cottonseed meal, one-quarter corn and cob meal and one-quarter oats. There was very little difference between the gains made by lots I and V. Lot I received a grain ration made up of one-fifth cottonseed meal, two-fifths corn chops and two-fifths oats, and Lot V a grain ration of cottonseed meal alone. The smallest gains were made by Lot III, which received a grain ration of two-thirds cottonseed meal and one-third corn and cob meal. The gains make it apparent that a grain ration of one part cottonseed meal to one part chopped corn, corn and cob meal, or oats, produces larger gains than a ration containing either a larger or smaller pro-

portion of cottonseed meal when corn silage and Johnson grass hay are used for roughage.

QUANTITY AND COST OF FEEDS REQUIRED TO MAKE 100 POUNDS OF GAIN

Table V, showing weights and gains, reveals quite a latitude of choice in the feed stuffs that can be used to secure good gains on fattening calves. When the data are compared with those shown in Table VI it becomes easy to make the choice of feeds depend largely on their relative costs and availability.

Table VI shows the quantity of the different feeds required to produce 100 pounds of gain with each lot of calves and the cost per 100 pounds gain when the feeds were valued at the prices prevailing in the fall of 1915.

TABLE VI

QUANTITY AND COST OF FEEDS REQUIRED TO MAKE 100 POUNDS GAIN

TEST PERIOD, NOVEMBER 16 TO APRIL 30—167 DAYS

LOT	RATION	Pounds of Feed to Make 100 Pounds Gain	Cost of 100 Pounds Gain
I	Corn chops—⅖	237.43	
	Oats—⅖	237.43	
	Cottonseed meal—⅕	118.76	$12.14
	Corn silage	1359.9	
	Johnson grass hay	188.85	
II	Corn chops—½	260.38	
	Cottonseed meal—½	260.38	$10.93
	Corn silage	1648.92	
	Johnson grass hay	181.76	
III	Corn and cob meal—⅓	300.14	
	Cottonseed meal—⅔	150.07	$10.04
	Corn silage	1913.12	
	Johnson grass hay	188.19	
IV	Corn and cob meal—¼	125.9	
	Oats—¼	125.9	
	Cottonseed meal—½	251.8	$10.29
	Corn silage	1337.06	
	Johnson grass hay	179.59	
V	Cottonseed meal	307.89	
	Corn silage	1669.08	$ 8.08
	Johnson grass hay	191.78	

According to the preceding table, the cost of producing 100 pounds of gain varied inversely with the proportion of cottonseed meal in the ration. It is also seen that 1 pound of cottonseed meal had approximately the same feeding value of 2 pounds of corn chops or oats, and slightly over 2 pounds of corn and cob meal. It is apparent that when cottonseed meal can be bought for $30.00 a ton and corn at 75 cents a bushel—about the same price pound for pound—the cheapest gains can be made from a ration containing large proportions of cottonseed meal.

The financial result shown in Table VII is of value when the same relative costs of feeds used is constant. Variation in feed prices, however, might show an entirely different financial result. Any financial statement is at best an unsatisfactory summary of the results. Not only will variation in feed prices make a wide va-

riation in results, but fluctuating market conditions will also caus one ration to show superior to another which under normal cond tions is the more profitable ration. The five lots of calves were sol rather on weight than on finish, as will be seen when the financia statement is compared with the slaughter data.

TABLE VII

FINANCIAL STATEMENT

Preliminary and Test Periods, 208 Days

LOT I

To 5 calves, 1956.16 lbs. at $6.00 a cwt.	$117.37	
To 200.49 lbs. bran at $28.00 a ton	2.80	
To 2959 lbs. oats at $.55 a bushel	50.61	
To 323.78 lbs. corn and cob meal at $.80 a bushel	3.69	
To 2635.6 lbs. corn chops at $.80 a bushel	36.89	
To 1335.54 lbs. cottonseed meal at $30.00 a ton	20.02	
To 15050 lbs. corn silage at $3.00 a ton	22.52	
To 2090 lbs. Johnson grass hay at $10.00 a ton	10.45	
To pasturage at $1.00 a calf per month	6.82	
To freight, yardage, commission, etc.	17.41	
Total expenditures	$288.53	
By sale of 5 calves, 3280 lbs. at $8.85 a cwt		$290.2
Net Profit		1.7
Profit per calf		.3

LOT II

To 5 calves, 2290.5 lbs. at $6.00 a cwt.	$137.43	
To 200.49 lbs. bran at $28.00 a ton	2.80	
To 323.78 lbs. corn and cob meal at $.80 a bushel	3.69	
To 324 lbs. oats at $.55 a bushel	5.54	
To 3002 lbs. corn chops at $.80 a bushel	42.02	
To 3009.74 lbs. cottonseed meal at $30.00 a ton	45.29	
To 18960 lbs. corn silage at $3.00 a ton	28.42	
To 2090 lbs. Johnson grass hay at $10.00 a ton	10.45	
To pasturage at $1.00 a calf per month	6.82	
To freight, yardage, commission, etc.	17.41	
Total expenditures	$299.07	
By sale of 5 calves, 3660 lbs. at $9.15 a cwt.		$334.8
Net profit on lot		35.8
Profit per calf		7.1

LOT III

To 5 calves, 2515.8 lbs. at $6.00 a cwt.	$150.94	
To 200.49 lbs. bran at $28.00 a ton	2.80	
To 1908.65 lbs. corn and cob meal at $.80 a bushel	21.77	
To 324 lbs. oats at $.55 a bushel	5.54	
To 3187.34 lbs. cottonseed meal at $30.00 a ton	47.81	
To 20230 lbs. corn silage at $3.00 a ton	30.34	
To 2090 lbs. Johnson grass hay at $10.00 a ton	10.45	
To pasturage at $1.00 a calf per month	6.82	
To freight, yardage, commission, etc.	17.41	
Total expenditures	$293.88	
By sale of 5 calves, 3830 lbs. at $9.25 a cwt.		$354.27
Net profit on lot		60.39
Profit per calf		12.08

LOT IV

To 5 calves, 2022.6 lbs. at $6.00 a cwt	$121.30	
To 200.49 lbs. bran at $28.00 a ton	2.80	
To 1793.78 lbs. corn and cob meal at $.80 a bushel	20.48	
To 1794 lbs. oats at $.55 a bushel	30.59	
To 2957.74 lbs. cottonseed meal at $30.00 a ton	44.37	
To 15560 lbs. corn silage at $3.00 a ton	23.35	
To 2090 lbs. Johnson grass hay at $10.00 a ton	10.45	
To pasturage at $1.00 a calf per month	6.82	
To freight, yardage, commission, etc.	17.41	
Total expenditures	$277.63	
By sale of 5 calves, 3410 lbs. at $8.75 a cwt		$297.38
Net profit on lot		19.75
Profit per calf		3.95

LOT V

To 5 calves, 2151 lbs. at $6.00 a cwt	$129.06	
To 200.49 lbs. bran at $28.00 a ton	2.80	
To 323.78 lbs. corn and cob meal at $.80 a bushel	3.69	
To 324 lbs. oats at $.55 a bushel	5.54	
To 3431.24 lbs. cottonseed meal at $30.00 a ton	51.47	
To 18460 lbs. corn silage at $3.00 a ton	27.67	
To 2120 lbs. Johnson grass hay at $10.00 a ton	10.60	
To pasturage at $1.00 a calf per month	6.82	
To freight, yardage, commission, etc.	17.41	
Total expenditures	$255.08	
By sale of 5 calves, 3570 lbs. at $8.35 a cwt		$298.29
Net profit on lot		43.21
Profit per calf		8.64

This table shows that the largest profit, $12.08 per calf, was made on Lot III, which received one-third corn and cob meal and two-thirds cottonseed meal as the concentrate ration. The next largest profit was made on Lot V, which received cottonseed meal alone for a concentrate and returned a profit of $8.64 per calf. Lot II, which received equal parts chopped corn and cottonseed meal, made the third largest profit of $7.16 per calf. Though lots IV and II were fed advantageously, in that all feeds were marketed through the calves at good prices on the farm, the net profit derived from each lot indicates that oats are not fed to fattening calves profitably if they cost 55 cents a bushel and corn costs 75 cents a bushel. The net profit of Lot IV was $3.95 per calf; of Lot I, $.35 per calf.

Table VIII shows the result of the different rations fed as reflected in the dressing percentages when slaughtered. As a rule, when cattle are of the same quality as to breeding and size any difference in market price is in favor of those carrying the greatest degree of finish. This difference is made on the basis that a finished steer will dress out a larger percentage of salable meat than one not so fat. The quality of the meat of the fatter steer is also superior to that of the poorer one.

TABLE VIII
SLAUGHTER DATA

LOT	RATION	Average final weight per calf	Average market weight per calf	Average shrink in transit	Percentage dressed by market weight	Selling price per cwt.
I	Corn Chops—⅖ Oats—⅖ Cottonseed meal—⅕ Corn silage Johnson grass hay	671. lbs.	656. lbs.	2.24%	58 30 lbs.	$8.85
II	Corn chops—½ Cottonseed meal—½ Corn silage Johnson grass hay	751. lbs.	732. lbs.	2.64%	58.01 lbs.	$9.15
III	Corn and cob meal—⅓ Cottonseed meal—⅔ Corn silage Johnson grass hay	776. lbs.	766. lbs.	1.39%	57.49 lbs.	$9.25
IV	Corn and cob meal—¼ Oats—¼ Cottonseed meal—½ Corn silage Johnson grass hay	697. lbs.	682. lbs.	2.16%	57 21 lbs.	$8.75
V	Cottonseed meal Corn silage Johnson grass hay	721.4 lbs.	714. lbs.	1 03%	56.70 lbs.	$8.35

The dressing percentages of the calves in the various lots show that the rations containing the larger proportions of corn produced fatter carcasses than the rations containing chiefly cottonseed meal. This is in keeping with previous experiments, which show that although cottonseed meal produces very cheap and economical gains the tendency of calves on a cottonseed meal ration is rather to grow than to fatten.

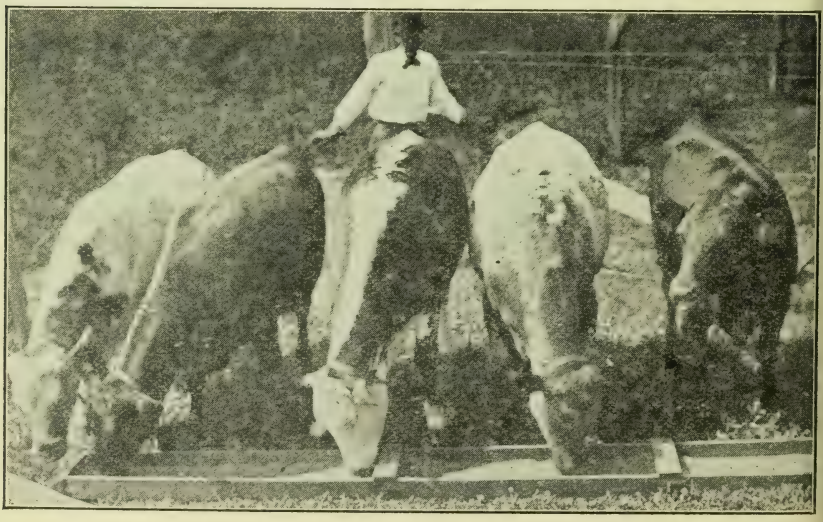

FIG. 1—PRIME BABY BEEF—EXPT. 1, LOT III
These calves were fed on a ration of one-third corn and cob meal and two-thirds cottonseed meal, and were sold at fourteen months old on the St. Louis Market for $9.25 a hundred-weight.

EXPERIMENT 2—FATTENING LATE CALVES, Winter 1914-15

Cottonseed Meal, Cold Pressed Cake, Corn and Cob Meal, Corn Silage, Johnson grass Hay, and Cottonseed Hulls for fattening calves.

CALVES USED

The calves used in this experiment were a mixed lot of grade Angus, Hereford, and Shorthorn steers and heifer calves. When put on feed they averaged in age from 10 to 14 months and were of such class as would ordinarily be carried over winter as stockers. Having lost their calf fat they were not in good fattening but in vigorous growing condition.

FEED LOTS

All calves were fed in the same feed lots as described under Experiment 1.

CHARACTER AND PRICE OF THE FEEDS

The cottonseed meal, cold pressed cake, and cottonseed hulls, were bought in the open market at the prices shown in Table I. The corn, corn silage, and Johnson grass hay were raised on the station farm, and were of good quality.

TABLE I
MARKET PRICE OF FEEDS USED

Cottonseed meal	$22.50 a ton
Cold pressed cake	17.50 a ton
*Corn and cob meal	21.43 a ton
Corn silage	3.00 a ton
Johnson grass hay	10.00 a ton
Cottonseed hulls	6.00 a ton

*On the basis of 80 cent corn costing 2 cents a bushel to grind into corn and cob meal.

AVERAGE DAILY RATION

The calves were taken off pasture and put in the feed lot December 1, 1914, and were fed for a period of 137 days, that is until April 16, 1915. They were started on the following daily rations per calf for each lot:

Lot I

Cottonseed Meal	2 lbs.
Corn and cob meal	4 lbs.
Corn silage	20 lbs.

Lot II

Cold pressed cake	3 lbs.
Corn and cob meal	4 lbs.
Corn silage	20 lbs.

Lot III

Cottonseed meal	2.5 lbs.
Corn and cob meal	2.5 lbs.
Johnson grass hay	5. lbs.
Corn silage	11.7 lbs.

Lot IV

Cold pressed cake	3.75 lbs.
Corn and cob meal	2.5 lbs.
Johnson grass hay	5. lbs.
Corn silage	11.7 lbs.

Lot V

Cottonseed meal	2 lbs.
Corn and cob meal	4 lbs.
Cottonseed hulls	10 lbs.

During the first part of the feeding period the silage for Lots I, II, III, and IV, and the hulls for Lot V were increased as rapidly as the calves would take care of it. During the latter part of the period, however, the cottonseed meal and cold pressed cake were increased in the various lots to all that the calves could clean up.

The average daily rations per calf of each lot for the entire feeding period of 137 days is shown in Table II.

TABLE II
AVERAGE DAILY RATION
137 DAYS

FEED	Lot I	Lot II	Lot III	Lot IV	Lot V
	Pounds	Pounds	Pounds	Pounds	Pounds
Cottonseed meal	2.71		2 97		2.7
Cold pressed cake		4.05		4.45	
Corn and cob meal	4.	4.	4.	4.	4.
Corn silage	22.55	22.55	17.6	17.6	
Johnson grass hay			5.	5.	
Cottonseed hulls					13.76

WEIGHTS AND GAINS

The calves were weighed individually at each weighing and were weighed frequently throughout the feeding period.

Table III shows the average weight per calf in each lot at the beginning of the feeding period and at the conclusion of the feed period; the average total gain per calf, and the average daily gain per calf for each lot.

TABLE III

Lot	Average initial weight per calf	Average final weight per calf	Average total gain per calf	Average daily gain per calf
I	505. lbs.	696. lbs.	191. lbs.	1.39 lbs.
II	508.8 lbs.	724.5 lbs.	215.7 lbs.	1.58 lbs.
III	510.2 lbs.	722.8 lbs.	212.6 lbs.	1.55 lbs.
IV	501.8 lbs.	730.8 lbs.	229. lbs.	1.67 lbs.
V	502. lbs.	683.7 lbs.	181.7 lbs.	1 32 lbs.

As the preceding table shows, satisfactory gains were made by all lots. Comparison of Lot I with Lot II and of Lot III with Lot IV shows the relative value of cottonseed meal and cold pressed cake. Likewise comparison of the gains made by Lot I and Lot V shows the feeding value of cottonseed hulls and corn silage. These comparisons are shown impressively in Table IV, which gives the pounds of feed required to produce 100 pounds of gain.

TABLE IV

QUANTITY AND COST OF FEED REQUIRED TO MAKE 100 POUNDS GAIN

FEED	Lot I	Lot II	Lot III	Lot IV	Lot V
	Pounds	Pounds	Pounds	Pounds	Pounds
Cottonseed meal	192.24		191.4		204.
Cold pressed cake		258.		277.5	
Corn and cob meal	286.91	254.1	257.7	249.1	301.4
Corn silage	1617.8	1432.8	1134.	1096.2	
Johnson grass hay			322.1	311.3	
Cottonseed hulls					1036.7
Cost per 100 lbs. gain	$7.68	$7.13	$8.23	$8.29	$8.63

The rations used were based on the assumption that 1 pound of cottonseed meal is in feeding value equivalent to approximately 1.5 pounds of cold pressed cake. From Tables III and IV it would seem that 1 pound of cottonseed meal as fed to Lot I has the same feeding value as 1.29 pounds of cold pressed cake which was fed to Lot II. When Lots III and IV are compared, however, 1 pound of cottonseed meal as fed to Lot III has the feeding value of 1.45 pounds of cold pressed cake as fed to Lot IV.

Comparison of corn silage with cottonseed hulls as a roughage for calves shows that 1 pound of cottonseed hulls as fed in Lot V has the feeding value of 1.56 pounds of corn silage as fed in Lot I.

The cost of producing 100 pounds gain is shown to be $7.68, $7.13, $8.23, $8.29, and $8.63 for Lots I, II, III, IV, and V respectively. The cost of producing 100 pounds of gain was 55 cents less when 4.05 pounds of cold pressed cake were fed as the daily ration than when 2.71 pounds of cottonseed meal were fed. In each case 4 pounds of corn and cob meal and corn silage as a roughage, were given as supplementary feeds.

When 5 pounds of Johnson grass hay were added to the daily ration per calf and the cottonseed meal and cold pressed cake fed at the rate of 2.97 pounds and 4.45 pounds respectively, the cost of producing 100 pounds gain is $.06 cheaper in favor of cottonseed meal.

With cottonseed hulls at $6.00 a ton and corn silage at $3.00 a ton, 100 pounds of gain were produced $.95 cheaper from corn silage than from hulls.

Table V is the financial statement of the experiment. The feeds are given values prevalent in the fall of 1914.

TABLE V

FINANCIAL STATEMENT

LOT I

To 6 calves, 3029 lbs. at $6.00 a cwt.	$181.74	
To 2226 lbs. cottonseed meal at $22.50 a ton	25.04	
To 3288 lbs. corn and cob meal at $21.43 a ton	35.23	
To 18540 lbs. corn silage at $3.00 a ton	27.81	
To freight, yardage, commission, etc.	17.41	
Total expenditures		$287.23
By sale of 6 calves, 4050 lbs. at $8.25 a cwt.		$334.13
Total net profit		46.90
Average profit per calf		7.82

LOT II

To 6 calves, 3053 lbs. at $6.00 a cwt.	$183.18	
To 3339 lbs. cold pressed cake at $17.50 a ton	29.22	
To 3288 lbs. corn and cob meal at $21.43 a ton	35.23	
To 18540 lbs. corn silage at $3.00 a ton	27.81	
To freight, yardage, commission, etc.	17.41	
Total expenditures	$292.85	
By sale of 6 calves, 4217 lbs. at $8.25 a cwt.		$347.90
Total net profit		55.05
Average net profit per calf		9.18

LOT III

To 6 calves, 3061 lbs. at $6.00 a cwt.	$183.66	
To 2442 lbs. cottonseed meal at $22.50 a ton	27.47	
To 3288 lbs. corn and cob meal at $21.43 a ton	35.23	
To 14470 lbs. corn silage at $3.00 a ton	21.71	
To 4110 lbs. hay at $10.00 a ton	20.55	
To freight, yardage, commission, etc.	17.41	
Total expenditures	$306.03	
By sale of 6 calves, 4207 lbs. at $8.25 a cwt.		$347.08
Total net profit		41.05
Average net profit per calf		6.84

LOT IV

To 6 calves, 3065 lbs. at $6.00 a cwt.	$183.90	
To 3663 lbs. cold pressed cake at $17.50 a ton	32.05	
To 3288 lbs. corn and cob meal at $21.43 a ton	35.23	
To 14470 lbs. corn silage at $3.00 a ton	21.71	
To 4110 lbs. hay at $10.00 a ton	20.55	
To freight, yardage, commission, etc.	17.41	
Total expenditures	$310.85	
By sale of 6 calves, 4253 lbs. at $8.25 a cwt.		$350.87
Total net profit		40.02
Average net profit per calf		6.67

LOT V

To 6 calves, 3011 lbs. at $6.00 a cwt.	$180.66	
To 2226 lbs. cottonseed meal at $22.50 a ton	25.04	
To 3288 lbs. corn and cob meal at $21.43 a ton	35.23	
To 11310 lbs. cottonseed hulls at $6.00 a ton	33.93	
To freight, yardage, commission, etc.	17.41	
Total expenditures	$292.27	
By sale of 6 calves, 3979 lbs. at $8.25 a cwt.		$328.27
Total net profit		36.00
Average net profit per calf		6.00

This table easily shows that yearling calves of fair breeding can be fed out profitably even though they be in rather poor condition when started on feed and not strictly prime beef when they are finished.

The financial statement shows furthermore that late summer and fall calves can be carried over winter at teat, pastured the fol-

lowing summer, and fed out profitably as yearlings even though strictly prime beef is not produced.

TABLE VI
SLAUGHTER DATA

Lot	Average farm weight per calf	Average market weight per calf	Average loss in transit per calf	Percentage loss in transit	Dressing percentage
I	696. lbs.	675. lbs.	21. lbs.	3.02%	56.13%
II	724.5 lbs.	702.8 lbs.	21.7 lbs.	2.99%	56.13%
III	722.8 lbs.	701.2 lbs.	21.6 lbs.	2.99%	56.13%
IV	730.8 lbs.	708.8 lbs.	22. lbs.	3.01%	56.13%
V	683.7 lbs.	662.2 lbs.	21.5 lbs.	3.15%	56.13%

The slaughter data, Table VI, show all calves to have finished with unusual uniformity. The shrinkage, in transit, was approximately 3 per cent of their barn weights. The calves were so uniformly finished throughout that they were killed as a whole. The dressing percentage of their market weight was 56.13 per cent.

PART II

Experiments by the Bureau of Animal Industry Co-operating With the Mississippi Experiment Station

EXPERIMENT 1—FATTENING CALVES, 1914-15

Cottonseed Meal, Corn and Cob Meal, Cottonseed Hulls, Corn Silage, and Alfalfa Hay for Fattening Calves.

OBJECT OF THE EXPERIMENT

The object of this test was to get further information concerning the use of cottonseed meal and mixtures of cottonseed meal and corn and cob meal for finishing calves for the market.

CALVES USED

The calves used in the experiment were grade Shorthorn, Angus, and Red Polled, the Shorthorns predominating in numbers. They were out of grade beef cows, were sired by registered bulls, and were representative of the second to third cross of good beef bulls on the native Mississippi cows. The quality of these calves would not let them make strictly first class baby beef. They were good stockers, for the making of good feeder steers.

FEED LOTS AND WATER SUPPLY

All calves were fed in a large barn which was open enough on the sides to permit thorough ventilation. About 50 square feet of space was allowed each calf for lying down and exercising. The plan of the barn was such that the calves could not have the run of open lots. For the first six weeks the pens were kept well bedded but after that, because of scarcity of bedding, were quite muddy and sloppy.

A water trough was in each pen, and water was furnished from a deep well. Feed troughs were used for feeding the silage and grain, and alfalfa was fed in racks over the troughs. The shattered leaves from the racks fell into the feed trough, so there was no waste of feed.

The feeding was done at 7 o'clock in the morning and at 3 o'clock in the afternoon.

CHARACTER AND PRICE OF THE FEEDS

Since this experiment was for the comparison of grain rations, the roughage for all lots was the same. The calves of all lots were fed about 5½ pounds of cottonseed hulls and 3½ pounds of alfalfa hay per head, daily, and were given all the silage they would eat.

The cottonseed meal was in quality about the average. An-

alysis showed an ammonia content equal to about 7.2 per cent of nitrogen. The corn was not quite so good as the average Mississippi corn.

The cottonseed hulls were of average quality. During the greater part of the experiment the hulls were good; but for a very short period some hulls of inferior grade were used, until good hulls could be obtained. The alfalfa hay which was bright and of good

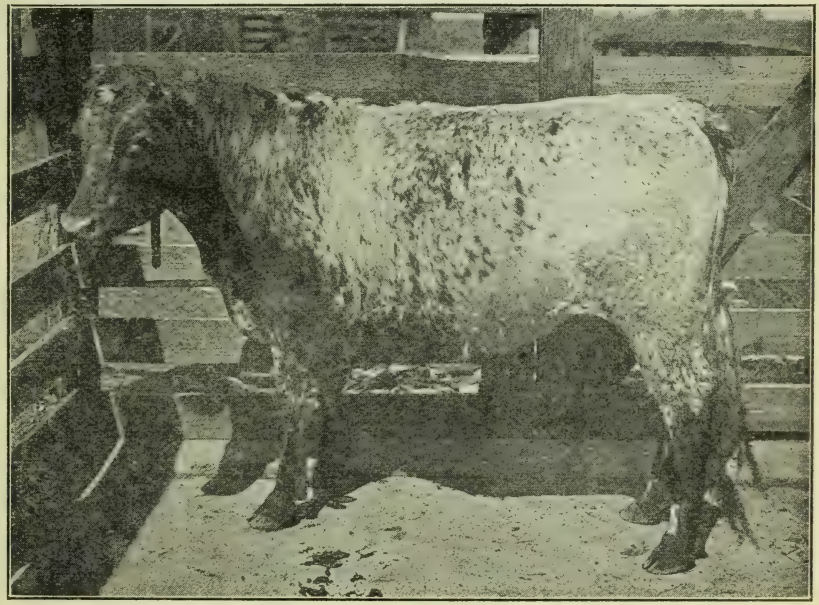

FIG. 2—A MARKET TOPPER

Grade Shorthorn steer 15 months old, weighing 820 pounds, and selling at St. Louis as baby beef at $9.25 a hundredweight. Bred and finished by the Mississippi Experiment Station

quality, contained a little Johnson grass. The corn silage contained very little grain this year, and was not so good as is usually made on Southern farms. Taken as a whole, the feeds, with the exception of the silage, were just about the average used on the stock farms of the South.

The following prices were used for the feeds:

Cottonseed meal	$23.50 a ton
Cottonseed hulls	6.50 a ton
Corn and cob meal	.70 a bu.
Corn silage	3.00 a ton
Alfalfa hay	15.00 a ton

The prices used for cottonseed hulls and meal were the actual

costs; those used for other feeds represented a good price for the farm grown feeds—a profit to the farm in the production of them.

AVERAGE DAILY RATIONS BY PERIODS

The calves of all lots had a preliminary feeding period from October 25 to November 13. During this time they got accustomed to the feed lots and to their feeds; and recovered from dehorning. They were therefore in condition to take readily to their feeds when started in the regular feeding period. During the preliminary period the feeds for all calves were gradually increased until the end of the second 28 day period. After that, the amount of concentrate was unvaried.

The following table shows the average daily ration per calf by 28-day periods.

TABLE I
AVERAGE DAILY RATIONS BY 28-DAY PERIODS

Lot	No. of Calves	FEED	1st. Period	2nd. Period	3rd. Period	4th. Period	5th. Period 31 days
			Pounds	Pounds	Pounds	Pounds	Pounds
I	14	Cottonseed meal	2.8	3.4	4.0	4.0	4.0
		Cottonseed hulls	5 0	5.0	6.1	6.4	6.8
		Corn silage	11.3	11.4	13.8	14.2	14.8
		Alfalfa hay	3.6	3.9	3.4	2.7	3.9
II	12	Cottonseed meal	2.6	3.3	3.3	3.3	3.6
		Corn and cob meal	1.3	1.6	1.6	1.6	1.8
		Cottonseed hulls	4.9	4.7	5.7	6.4	7.1
		Corn silage	11.1	11.2	12.9	14.2	15.1
		Alfalfa Hay	3.3	3.6	3.1	3.3	4.4
III	14	Cottonseed meal	1.4	1.8	1.9	1.9	2.0
		Corn and cob meal	2.9	3.6	3.7	3.7	3.9
		Cottonseed hulls	5.0	4.7	4.8	5.3	6.3
		Corn silage	11.2	11.1	11.5	11.8	13.9
		Alfalfa hay	3.5	3.6	3.2	2.7	4.1

As the calves were never fed a heavy grain ration, the amount of roughage consumed did not decrease as the feeding progressed: in fact, it increased gradually as the calves increased in weight. The amount of alfalfa hay consumed by each lot was very uniform for each lot and for all periods of the experiment.

WEIGHTS AND GAINS

The regular feeding period began November 13, 1914. All calves were weighed individually on November 12, 13, and 14, and the average of the three weighings for each calf taken as the initial weight. Each lot of calves was weighed every 28 days during the test, and all calves were weighed individually at the close of the test. The calves were weighed about ten o'clock in the morning of each weigh day.

Table II shows the average weights per calf and the gains.

TABLE II
WEIGHTS AND GAINS
NOVEMBER 13 1914, TO APRIL 5, 1915—143 DAYS*

LOT	RATION	Average initial weight per calf	Average final weight per calf	Average total gains per calf	Average daily gains per calf
		Pounds	Pounds	Pounds	Pounds
I	Cottonseed meal Cottonseed hulls Corn silage Alfalfa hay	437	683	245	1.71
II	Cottonseed meal—⅔ Corn and cob meal—⅓ Cottonseed hulls Corn silage Alfalfa hay	427	695	268	1.87
III	Cottonseed meal—⅓ Corn and cob meal—⅔ Cottonseed hulls Alfalfa hay	436	663	227	1.59

*Preliminary feeding October 25 to November 12, inclusive.

The gains for the first two lots were very satisfactory for calves of their size and quality. The gain for Lot III was not so satisfactory; but when the daily ration of the calves are considered, it is seen that the calves of Lot III did not get as valuable grain ration as those of Lots I and II, if the theory is true that one pound of cottonseed meal is equal in feeding value to two pounds of corn for fattening calves.

QUANTITY AND COST OF FEEDS REQUIRED TO MAKE 100 POUNDS OF GAIN

Figures showing the amount of different kinds or of different combinations of feeds to make 100 pounds of gain in weight are of most importance to prospective feeders. When a feeder knows the value of his cattle and the available feeds, he can determine easily which feeds will be most profitable to use, if he is given the data showing the amount of feed required to make 100 pounds of gain, the effects of such feeds on the quality of the carcass, and the selling price of the animal.

Table III shows the quantity of feeds required to make 100 pounds of gain and the cost of making 100 pounds of gain when feeds were valued at the prices given herein.

TABLE III

QUANTITY AND COST OF FEED REQUIRED TO MAKE 100 POUNDS OF GAIN

NOVEMBER 13, 1914 TO APRIL 5, 1915—143 DAYS

Lot	RATION	Pounds of feed to make 100 lbs. of gain	Cost of 100 lbs. gain
I	Cottonseed meal	214	
	Cottonseed hulls	346	
	Corn silage	774	
	Alfalfa hay	207	$6.34
II	Cottonseed meal—⅔	172	
	Corn and cob meal—⅓	86	
	Cottonseed hulls	309	
	Corn silage	690	
	Alfalfa hay	191	$6.34
III	Cottonseed meal—⅓	112	
	Corn and cob meal—⅔	225	
	Cottonseed hulls	331	
	Corn silage	753	
	Alfalfa hay	217	$7.40

There is not a great variation in the amount of roughage required to make 100 pounds of gain on the calves of the various lots, therefore, a direct comparison of the concentrates can be made.

When cottonseed meal was the sole concentrate, the calves of Lot I required 214 pounds to make 100 pounds of gain. The calves of Lot II required 172 pounds of cottonseed meal and 86 pounds of corn and cob meal to make the same amount of gain. The calves of Lot III required 112 pounds of cottonseed meal and 225 pounds of corn and cob meal to make 100 pounds of gain.

In this test when one-third of the cottonseed meal was replaced by an equal amount of corn and cob meal each pound of cottonseed meal proved to be equal in feeding value to 2.05 pounds of corn and cob meal, and when two-thirds of the ration was made up of corn and cob meal, each pound of cottonseed meal proved the equivalent of 2.21 pounds of corn and cob meal. This result has been in keeping with other experiments made with corn and cottonseed meal in the South.

At the prices which prevailed for feeds in 1914-15, the cost per 100 pounds gain for Lots I, II, and III, was $6.34, $6.34, and $7.40 respectively. This is exceedingly satisfactory as the average for all calves is less than 7 cents per pound of gain. For mature animals fed on similar feeds the cost for each pound of gain would have been from 1½ to 4 cents more, showing the superior manner in which the calves utilize their feed. In fact, good calves are the only class of cattle that will put on gains in the feed lot at a price equal or less than the selling price of the animal per pound.

FINANCIAL STATEMENT

Table IV shows the financial results of the feeding experiments for all calves. The calves of Lot I were finished somewhat better than those of either of the other lots. The calves of Lots II

and III showed lack of finish, because of the small grain ration they were fed. Their selling price was consequently decreased.

TABLE IV

FINANCIAL STATEMENT

November 13, 1914—April 5, 1915—143 days.

LOT I—Cottonseed meal, cottonseed hulls, corn silage, alfalfa hay.

To 14 calves, 6118 lbs. at $5.00 a cwt.	$305.90	
To 7342 lbs. cottonseed meal at $23.50 a ton	86.27	
To 11853 lbs. cottonseed hulls at $6.50 a ton	38.52	
To 26533 lbs. corn silage at $3.00 a ton	39.80	
To 7110 lbs. alfalfa hay at $15.00 a ton	53.32	
To freightage, yardage, commission, insurance, etc., 14 head at $2.175 a head	30.45	
Total expenditures	$554.26	
By sale of 14 calves, 8740 lbs. at $7.25 a cwt.		$633.65
Total profit on Lot I		79.39
Average profit per calf		5.67

LOT II—Cottonseed meal, two-thirds; cottonseed hulls, corn and cob meal, one-third; corn silage; alfalfa hay.

To 12 calves, 5124 lbs. at $5.00 a cwt.	$256.20	
To 5529 lbs. cottonseed meal at $23.50 a ton	64.96	
To 2764 lbs. corn and cob meal at $.79 a bushel	27.64	
To 9940 lbs. cottonseed hulls at $6.50 a ton	32.30	
To 22185 lbs. corn silage at $3.00 a ton	33.28	
To 6155 lbs. alfalfa hay at $15.00 a ton	46.16	
To freight, yardage, commission, insurance, etc., 12 calves at $2.175 a head	26.10	
Total expenditures	$486.64	
By sale of 10 calves, 6130 lbs. at $7.25 a cwt.		$444.42
By sale of 2 calves, 1200 lbs. at $6.50 a cwt.		78.00
Total by sale of 12 calves		$522.42
Total profit on Lot II		35.78
Average profit per calf		2.98

LOT III—Cottonseed meal, one-third; corn and cob meal, two-thirds; cottonseed hulls, corn silage, alfalfa hay.

To 14 calves, 6111 lbs. at $5.00 a cwt.	$305.55	
To 3756 lbs. cottonseed meal at $23.50 a ton	44.13	
To 7141 lbs. corn and cob meal at $.70 a bushel	71.41	
To 10512 lbs. cottonseed hulls at $6.50 a ton	34.16	
To 23922 lbs. corn silage at $3.00 a ton	35.88	
To 6897 lbs. alfalfa hay at $15.00 a ton	51.73	
To freight, yardage, commission, insurance, etc., 14 calves, at $2.175 a head	30.45	
Total expenditures	$573.31	
By sale of 12 calves, 7600 lbs. at $7.25 a cwt.		$551.00
By sale of 2 calves, 1110 lbs. at $6.50 a cwt.		72.15
Total by sale of 14 calves		$623 15
Total profit on Lot III		49.84
Average profit per calf		3.56

No charge was made for the labor of feeding the calves, which was small; on the other hand, no credit is given to the calves for the manure produced, and no credit given for pork produced in Lots II and III. By this method it is seen that the calves of Lot I were more profitable than those of the other lots. This is due partly to the very cheap price of cottonseed meal at that time (due to the outbreak of the war) and to the comparatively high price of corn on the farm where it was grown.

When it is considered that, the corn, corn silage, and hay were sold through the calves at excellent prices, and that a net cash profit was made, we regard the results as very satisfactory.

Table V shows the shrinkage due to shipping and the dressing percentages of the calves when slaughtered.

TABLE V
SLAUGHTER DATA

Lot	RATION	Average farm wt. of each calf 4-12-15	Average market wt. of each calf 4-14-15	Average shrink in transit	Average weight of carcass	Percentage dressed by farm weights	Percentage dressed by market weights
		Pounds	Pounds	Pounds	Pounds		
I	Cottonseed meal Cottonseed hulls Corn silage Alfalfa hay	660	624	36.0	342	51.88	54.85
II	Cottonseed meal—⅔ Corn and cob meal—⅓ Cottonseed Hulls Corn silage Alfalfa hay	668	611	57.0	330	49.40	54.05
III	Cottonseed meal—⅓ Corn and cob meal—⅔ Cottonseed hulls Corn silage Alfalfa hay	651	622	29.0	335	51.44	53 87

The average shrinkage for all calves was 41 pounds per calf. The cause of heavier shrinkage of the calves of Lot II is unaccounted for. Though the calves of Lot II made the largest daily gains, they did not fatten so well as the calves of the other lots, which is reflected in the manner in which they dressed out. The calves of Lot I sold for a little more per hundred weight and dressed out slightly higher, than the calves of either of the other lots. The calves as a whole dressed out slightly over 54 per cent.

EXPERIMENT 2—HEAVY GRAIN RATION FOR FATTENING CALVES, 1915-16

FATTENING BEEF CALVES ON CORN, COTTONSEED MEAL, CORN SILAGE, AND ALFALFA

OBJECT OF THE EXPERIMENT

The objects of this test were:

1. To see if good grade calves such as can be easily raised in Mississippi can be finished for the market economically and profitably.

2. To make a comparative study of cottonseed meal alone, of a combination of cottonseed meal, and shelled corn, and of shelled

FIG. 3.—CALVES SHOWING QUALITY AND FINISH

These calves, fed during the winter 1915-16 by the Mississippi Experiment Station and sold for an average of $60 a head, were produced from grade cows worth about $50 apiece.

corn alone, as concentrated feeds to be used in finishing calves which are fed silage as the principal roughage and a small amount of alfalfa hay.

3. To determine approximately how much manure can be saved by feeding calves on a concrete floor under shelter.

CALVES USED

The calves used were from seven to eight months old, were a mixed lot of Shorthorns, Herefords, and Angus, and were of about the same quality as the calves used the previous year in Experiment 1.

CHARACTER AND PRICES OF FEEDS

The cottonseed meal was of good quality, analyzing from 7½ to 8 per cent ammonia. The corn was of good quality, being well matured and sound. The silage was of good quality, having been cut at the proper stage and carrying considerable grain. The corn would probably have yielded 45 bushels to the acre. The alfalfa was of rather low grade, as it had been damaged by heavy dew.

The feeds were charged at the following prices:

Cottonseed meal	$27.00 a ton
Corn	.70 a bu.
Corn silage	3.00 a ton
Alfalfa hay	15.00 a ton

Cattle that are to be fed a long period will—as is well known—make almost as large gains and much more economical gains if they are fed a medium grain ration and all the good roughage they will eat for the first part of the feeding period, and are given a heavy grain ration during the latter part of the period. This method was followed in the experiment.

The following table shows the average amount of feed consumed daily per calf in each lot for each 28-day period they were fed.

TABLE VI
AVERAGE DAILY RATIONS BY 28-DAY PERIODS, 1915-1916

Lot	Feed	1st Period	2nd period	3rd Period	4th Period	5th Period	6th Period (Sixteen days)	Average for entire period of 156 days
		Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
I	Cottonseed meal	2.2	2.7	3.5	4.3	5 0	5.0	3.69
	Corn silage	16.8	22.7	23.8	25.3	23 7	26.7	22.87
	Alfalfa hay	5.9	5.8	4.0	4.0	4 0	4.0	4.65
II	Cottonseed meal	1.0	1.2	1.3	1.6	2.0	2.0	1.49
	Shelled corn	4.1	4.8	5.4	6.6	8 0	8.0	6.01
	Corn silage	14.7	18.3	18.3	18 9	16.2	18.6	17.43
	Alfalfa hay	5.8	5.4	4.0	4.0	3 9	4.0	4.57
III	Shelled corn	6.0	7.1	8.1	9 7	11.1	12.0	8.78
	Corn silage	13.6	13.7	15.6	14.3	12 1	13.3	13.80
	Alfalfa hay	5.5	5.6	4.0	4 0	3.6	4.0	4.49

The amount of silage consumed daily by the calves of Lot II was about 5½ pounds per calf less than that consumed by the calves of Lot I. The calves of Lot III, which were fed on shelled corn alone as the concentrate, consumed about half as much silage each day during the last two periods, as the calves which were fed cottonseed meal.

Table VII shows the average initial weight, the average final weight, the average gain per calf, and the average daily gain per calf for the entire period.

TABLE VII
TOTAL AND DAILY GAINS
NOVEMBER 12, 1915, TO APRIL 16, 1916—156 DAYS

Lot	RATION	Average initial weight per calf	Average final weight per calf	Average total gains per calf	Average daily gains per calf
		Pounds	Pounds	Pounds	Pounds
I	Cottonseed meal Corn silage Alfalfa hay	430	701	271	1.74
II	Cottonseed meal Shelled corn Corn silage Alfalfa hay	430	695	265	1.7
III	Shelled corn Corn silage Alfalfa hay	434	714	280	1 8

The calves of Lot I were inclined to grow; so they fattened less rapidly than the calves of either of the other lots. The calves of Lot III were the fattest of the three lots, although there was not a great deal of difference, between the calves of Lots II and III.

QUANTITY AND COST OF FEED TO MAKE 100 POUNDS OF GAIN

The most important data in any feeding experiment are those relating to the daily ration, the rate of gain made by the animals, the amount of feed which is required to make 100 pounds of gain in weight, and the difference in selling price which results from the different methods of feeding. In the past, farmers and stockmen have paid too little attention to these figures and have laid too much stress upon the financial outcome of the special test, to get the most good out of the experimental work.

Table VIII shows the amount of feed required to produce 100 pounds of gain in weight on the calves and also the (comparative) cost of 100 pounds of gain.

TABLE VIII
QUANTITY AND COST OF FEED REQUIRED TO MAKE 100 POUNDS OF GAIN, AND SELLING PRICE OF CALVES
NOVEMBER 12, 1915, to APRIL 16, 1916—156 DAYS

Lot	RATION	Pounds of feed to make 100 lbs. of gain	Cost of 100 lbs. of gain	Selling price of Calves per 100 Lbs.
I	Cottonseed meal Corn silage Alfalfa hay	213 1318 268	$6.86	$8.17
II	Cottonseed meal Shelled corn Corn silage Alfalfa hay	88 353 1025 269	$9.05	$8.58
III	Shelled corn Corn silage Alfalfa hay	489 769 250	$9.14	$8.66

The calves in all lots received the same kind of roughage, but ate amounts varying with their appetites after consuming their grain. Though the daily gain of the calves in all lots was fairly uniform, the amount of roughage varied considerably. This variation is reflected in the amount of roughage required to make 100 pounds of gain.

The calves of Lot I required a very small amount of cottonseed meal and a comparatively large amount of cheap roughage to make 100 pounds of gain; the opposite is true of the calves of Lot III which received shelled corn as a concentrate. The calves of Lot III required more than twice as much grain to make 100 pounds of gain, somewhat less alfalfa, and only a little more than half as much silage. This resulted in more expensive gains for the calves receiving corn.

The exclusive use of cottonseed meal as a concentrate for calves has invariably resulted in good daily gains, and very economical gains. At the same time the calves have tended to grow more and fatten less than is desirable. The calves have consequently sold for somewhat less than corn fed calves, as shown in the table. The difference in selling price is often great enough to almost overcome the difference in the cost of production.

Strictly prime calves cannot be made by feeding them on cottonseed meal as the sole concentrate, though it is not always most profitable to put the maximum finish on calves, it is usually more profitable to have them well finished than half fat. It is more frequently the case that extra finish on calves pays better than it does on steers of two years or older.

FINANCIAL STATEMENT

Any financial statement is more or less unsatisfactory, because there are so many variations from year to year in the prices of feeds, selling prices of animals, and margin of profit, that the financial outcome may be completely reversed if any very radical change is made in any one of these factors. However, a financial statement, usually desired by the reader, is of some value for comparative purposes.

The calves were sold on the St. Louis market.

TABLE IX

FINANCIAL STATEMENT

November 12, 1915, to April 16, 1916—156 Days.

LOT I—Cottonseed meal, corn silage, alfalfa hay.

To 15 calves, 6450 lbs. at $5.00 a cwt.		$322.50
To 8636½ lbs. cottonseed meal at $27.00 a ton	$116.59	
To 53522 lbs. corn silage at $3.00 a ton	80.28	
To 10890 lbs. alfalfa hay at $15.00 a ton	81.68	
Total cost of feed		278.55

To freight charges	29.52	
To commission	7.03	
To yardage, hay, etc.	4.83	
Total miscellaneous expenditures		41.38
Total expenditures		$642.43
By sale of 15 calves, 9790 lbs. at $8.168 a cwt.		$799.65
Total net profit on Lot I		$157.22
Average net profit per calf		10.48

LOT II—Cottonseed meal, shelled corn, corn silage, alfalfa hay.

To 14 calves, 6017½ lbs. at $5.00 a cwt.		$300.88
To 3256 lbs. cottonseed meal at $27.00 a ton	$ 43.96	
To 13116 lbs. shelled corn at $.70 a bushel	163.95	
To 38076 lbs. corn silage at $3.00 a ton	57.11	
To 9986 lbs. alfalfa hay at $15.00 a ton	74.90	
Total cost of feed		339.92
To freight charges	27.55	
To commission	6.56	
To yardage, hay, etc.	4.51	
Total miscellaneous expenditures		38.62
Total expenditures		$679.42
By sale of 14 calves, 9320 lbs. at $8.578 a cwt.		$799.35
Total net profit on Lot II		$119.93
Average net profit per calf		8.57

LOT III—Shelled corn, corn silage, alfalfa hay.

To 15 calves, 6505 lbs. at $5.00 a cwt.		$325.25
To 20547 lbs. shelled corn (366.9 bu.) at $.70 a bu.	$256.84	
To 32289 lbs. corn silage at $3.00 a ton	48.43	
To 10515 lbs. alfalfa hay at $15.00 a ton	78.86	
Total cost of feed		384.13
To freight charges	29.52	
To commission	7.03	
To yardage, hay, etc.	4.83	
Total miscellaneous expenditures		41.38
Total expenditures		$750.76
By sale of 15 calves, 10170 lbs. at $8.662 a cwt.		$880.93
Total net profit on Lot III		$130.17
Average net profit per calf		8.68

In this table no credit is given for the pork made by hogs following the calves of Lots II and III. Without considering this, exceedingly satisfactory profits were made on all the lots even after paying the farmer an unusually good price for his corn, corn silage, and alfalfa hay.

Hogs were put in Lots II and III to follow the calves. When cholera broke out on one part of the farm some of the fattest shotes were sold. Later some pigs and sows were permitted to follow the calves; but under the conditions, accurate records could not be kept of gains made by them. It is estimated that there should be a pork credit of at least $3.00 a calf for each of the calves of Lot III.

If the pork credit were only $2.00 a calf in Lot III, the calves which were fed a ration of shelled corn alone, paid the farmer 70c a bushel for the corn produced on the farm, and market prices for all roughage consumed; in addition they made as much profit as the calves which had been fed exclusively on cottonseed meal costing only $27.00 a ton. This is especially significant and encouraging to the diversified farmer of the South; for when profits are as great from the feeding of corn at 70c a bushel as from the feeding of cottonseed meal at only $27.00 a ton. The farmer may advantageously feed the corn he grows. It is quite probable that in the future, he will profit even more by feeding corn than by feeding cottonseed meal, for cottonseed meal will sell undoubtedly for more than $27.00 a ton in the future. It is possible, however, that he may not enjoy this relative profit, for corn also may advance in price. Furthermore, the diversified farmer of the South with plenty of nutritious feeds,—such as silage, alfalfa, clover or cowpea hay, and corn—can finish out good calves without spending cash for feeds. The farmer who has no corn to feed, but has good roughage such as silage and hay, can feel sure that he can make good and economical gains by feeding cottonseed meal as the sole concentrate, though he cannot get the calves quite so well finished because of their tendency to grow when fed a heavy protein ration.

RECORDS OF MANURE PRODUCED

The calves were kept in pens with concrete floors under shelter, and the pens were scraped out daily and the manure was weighed. No bedding was used so there was some waste of liquid manure. The following table shows the amount of manure saved from the calves of each pen or lot.

TABLE X
MANURE YIELDS
November 12, 1915, to April 16, 1916—156 Days

Lot I.	Total yield	68,235.	lbs.
	Average per calf	4,549.	lbs.
	Average per calf daily	29.16	lbs.
Lot II.	Total yield	60,090.	lbs.
	Average per calf	4,083.	lbs.
	Average per calf daily	26.17	lbs.
Lot III.	Total yield	49,830.	lbs.
	Average per calf	3,322.	lbs.
	Average per calf daily	21.29	lbs.

No definite reason can be given for the calves of Lot I producing more manure than those of the other lots. The question arises, can it be possible that the high protein ration caused the calves to drink more water, thereby causing more liquid manure to be voided? The fact remains that the average amounts of manure produced per day by such calves was about 29 pounds per head.

SLAUGHTER DATA

Table XI shows the shrinkage from shipping to market and the dressing percentages of the calves.

TABLE XI
SLAUGHTER DATA

LOT	RATION	Average farm wt. per calf—4-16-16	Average market wt. per calf—4-19-16	Average shrinkage in transit	Percentage of shrinkage	Average weight of carcass	Percentage dressed by farm weight	Percentage dressed by market weight
		Pounds	Pounds	Pounds	Per cent	Pounds	Per cent	Per cent
I	Cottonseed meal Corn silage Alfalfa hay	701	653	48	6.8	363	49.3	54.4
II	Cottonseed meal Shelled corn Corn silage Alfalfa hay	695	666	29	4.2	380	53.7	56.0
III	Shelled corn Corn silage Alfalfa hay	714	678	36	5.0	387	53.1	55.9

The difference in shrinkage between the calves of the three lots cannot be accounted for as they were handled exactly alike. It is to be expected that the calves of Lot I would shrink somewhat more than the other calves because they were not so fat and had been consuming a greater amount of roughage per day,—but the difference was quite large.

The carcasses of the calves of Lot I showed less fat and less finish than those of Lots II and III. No difference could be seen between the carcasses of Lots II and III, as they all were well finished.

Bulletin No. 184 February, 1918

Cotton Experiments 1917

By H. B. BROWN *and* C. T. AMES

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

SUMMARY

THE WEATHER. Cold and dry weather during the spring and summer of 1917 retarded the growth of cotton plants. Early frosts in October shortened the crop in parts of the state.....Pages 3 and 4

BOLL WEEVIL DAMAGE. Over the State as a whole much less weevil damage was done in 1917 than during the two preceding years. Some of the northern counties suffered more than ever before.
Pages 4, 6, 11, 15, and 16

GOOD VARIETIES. Of the short cottons, Wannamaker-Cleveland, and selected strains of Trice and Lone Star ranked well, while Express and Webber-49 led the long cottons in money value. Pages 5-18

GOOD WILT RESISTANT VARIETIES. Lewis-63 and Tri-Cook made the best yields on wilt infected soil. Wannamaker-Cleveland is somewhat wilt resistant.....Pages 8-10

SINGLE STALK CULTURE. The results of the Single Stalk Culture experiment indicated that the increased yields obtained in some cases by this method are due to close spacing rather than to delayed thinning .....Page 11

DISTANCE WORK. The cotton spacing experiments carried on in 1917 showed as in former years that close spacing gives highest yields .....Pages 10 and 21

FERTILIZERS FOR COTTON. Fertilizers used under cotton at the Holly Springs Station throughout a period of twelve years paid well for the investment almost invariably.....Pages 18-20

FLOWERING AND YIELDS. There is much variation in number of flowers produced by different varieties. In general the variety that is able to produce and support the most flowers during the first part of the fruiting season is the most satisfactory for growing under weevil infestation.....Page 22

SELECTION PAYS. New strains developed by the Experiment Station through selection were in the majority among the ranking varieties in all the tests conducted.....Page 27

SOURCE OF SEED.....Pages 27 and 28

Cotton Experiments, 1917

By H. B. BROWN *and* C. T. AMES

Introduction

During the year 1917 the Mississippi Experiment Stations carried on various kinds of cotton experiments, similar in general to the work of the six years previous. At the Delta Branch Station and at the College Station considerable time was devoted to cotton breeding work in an effort to produce better yielding or more desirable strains of cotton. It will be seen that these efforts have been rather successful when the records of the new strains developed by the Experiment Stations are compared with records made by the standard varieties with which they were grown in the variety tests. Results of general interest are published in this bulletin, while certain others are reserved to be published later in technical papers or bulletins.

Variety studies were made at the College Station, Agricultural College; at the Holly Springs Branch Station, Holly Springs; at the Delta Branch Station, Stoneville; on the plantation belonging to W. T. Donaldson, Strongs, Monroe County; and on the plantation belonging to Mullens and Lacy, near Clarksdale. Cotton Experiments were discontinued at the McNeill Branch Station on account of heavy weevil infestation in that part of the State.

W. T. Donaldson, Jr. planted, cultivated, and picked the experimental cotton at Strongs, and Dr. W. J. Lacy planted and cultivated the cotton in the experimental plots near Clarksdale. The Experiment Station is greatly indebted to these gentlemen. Prof. C. T. Ames carried on the experiments at Holly Springs. Prof. G. B. Walker looked after the preparation of the soil before the planting and the cultivation of the experimental cottons grown at the Delta Branch Station. He also made valuable suggestions in regard to varieties to plant, and secured seed of certain varieties.

The Weather. Over a large part of the State the season was unfavorable for the growth of cotton. Beginning with March, heavy rainfall delayed farm work in many places, and during the first half of April cool wet weather further delayed the planting of the crop. The month of May was the coldest since statewide official records have been kept, being about 5.2° below normal. Precipitation was deficient except in a few northern counties, and growth of cotton was retarded considerably. There was continued drought over a considerable part of the state during June. This prevented plants from making proper growth, but it was favorable for culti-

vation and fields were got in good condition. July and August presented no unusual weather conditions and cotton made good progress. Cloudy, wet weather during the first part of September caused some boll rot and interfered with picking. The weather* during October was the coldest on record; frosts were early and frequent, killing frosts occurring everywhere except near the Gulf coast.

Boll Weevil Damage. In the state as a whole, considerably less boll weevil damage was done in 1917 than in 1915 or in 1916. In the southern part of the state less damage was done than for several years, while in the extreme northern and northeastern parts 1917 was the worst weevil year experienced.

Classing. The classing and stapling were done by H. L. Eustis, of Greenville, Miss. Prices quoted in the tables are for strict middling grade, and are based on the Greenville, Miss., market for December 31, 1917.

RESULTS FROM THE COLLEGE STATION

Weather

The following table, compiled from reports made by Dr. Chas. F. Briscoe, weather observer for A. and M. College, gives data on the most important meteorological factors having a bearing on cotton production in the region about Agricultural College, Miss.

TABLE 1—TEMPERATURE AND RAINFALL, 1917

MONTH	Mean Temperature	Departure from the Normal Temperature	Highest Temperature	Average Maximum Temperature	Lowest Temperature	Average Minimum Temperature	Total Precipitation in Inches	Departure from the Normal in Precipitation
January	49.6	+4.3	78	58.9	18	40.4	4.74	—0.2
February	49.8	+3.3	82	59.9	10	39.6	6.89	+1.7
March	56.2	+0.4	83	67.5	21	45.0	7.76	+1.5
April	63.8	+0.1	89	75.7	38	52.5	3.52	—0.9
May	66.8	—4.9	92	79.1	42	54.4	1.90	—2.3
June	78.0	—0.6	99	89.9	48	66.2	2.83	—1.6
July	80.7	—0.4	97	91.8	63	69.6	5.49	+0.4
August	79.3	—1.1	97	90.5	52	68.1	5.72	+1.7
September	73.4	—2.2	94	83.8	50	62.9	2.71	—0.2
October	60.2	—4.7	88	75.4	26	45.1	0.59	—1.4
Total rainfall for ten months							42.15	

*The weather records and discussion are based on reports issued by the U. S. Weather Bureau at Vicksburg, Miss. Local records at Agricultural College are kept by Dr. Chas. F. Briscoe.

VARIETY	Lbs. of seed cotton per plat	Lbs. of seed cotton per plat for perfect stand	Lbs. of seed cotton per acre for perfect stand	Per cent lint	Lbs. of lint per acre	Character of staple	Length of staple in inches	Value of lint per lb. in cents	Value of lint	Value of seed @ $70 per ton	Total money value	Rank in money value	Weight of 100 bolls in ounces
Simpkins	101.50	112.9	1422	35.0	497.7	Poor	¾	29½	$ 136.82	$ 32.37	$ 169.29	23	19
Dodds' Prolific (from Ky.)	102.00	106.0	1335	30.4	405.8	Fair	1 1/16	31½	127.82	32.55	160.37	26	24
Dodds' Prolific (from Exp. Sta.)	97.50	107.1	1349	30.6	412.7	Good	1⅛	35	144.45	32.79	177.24	20	21
Trice (Tenn. Station)	86.75	95.3	1200	29.9	358 8	Good	1 1/16 full	33½	119.19	29.47	148.66	31	21
Trice-270-41	124.75	134.1	1689	30.6	516.8	Good	1⅛	35	180.84	41.05	221.85	1	23
Cleveland (Wannamaker)	111.25	120.9	1523	35.6	542.1	Good	1 full	31½	170.76	34.33	205.09	4	25
Cleveland-43	98.00	106.5	1341	32.6	437.1	Good	1⅛	35	152.98	31.64	184.62	14	26
Cleveland Big Boll	91.50	108.9	1372	33.2	455.5	Good	1 1/16	32	145.76	32.09	177.85	19	28
Cleveland-641	86.50	93.0	1171	34.3	401.6	Fair	1	30½	122.48	26.95	149.43	28	23
Improved Cook	97.25	101.3	1276	34.9	445.3	Good	1	31	138.04	29.08	167.12	24	26
Cook-919	100.50	103.6	1305	38.4	501.1	Good	1	31	155.34	28.14	183.48	16	22
Triumph	76.00	80.0	1008	37.6	379.	Good	1 1/16 full	33½	126 96	22.01	148.97	30	34
Triumph X Express B-37-41	85.50	108.2	1363	32.6	444.3	Good	1⅛ full	37	164.39	32.16	196.55	9	24
Miller	91.75	94.6	1191	33.4	397.7	Good	1⅛	35	139.19	27.79	166.98	25	35
Rowden	83.75	87.2	1098	33.4	365.7	Good	1 1/16 full	33½	123.60	25.65	149.25	29	34
Sproull's Big Boll	78 00	82.1	1034	31.2	322.6	Fair	1 1/16 full	33	106.45	24.92	131.37	32	28
Lone Star-15	95.00	106.7	1344	35.8	481.1	Good	1⅛	35	168.35	30.20	198.55	6	27
Polk	98.25	102.8	1295	29.4	380.7	Good	1 3/16	39	147.47	32.02	179.49	18	19
Express-122	104.75	109.1	1374	27.9	383.3	Good	1 3/16 full	41	157.15	34.68	191.83	11	20
Express-350	112.25	116.9	1472	28.0	412.1	Good	1 3/16	39	160.62	37.10	197.72	8	20
Express-412	91.75	105.5	1329	28.3	376.1	Good	1 3/16	39	146.67	33.35	180.02	17	20
Express-432	115 00	120.0	1512	31.7	479.3	Fair	1 3/16	38½	184.43	36.15	220.58	2	20
Express-122-433	116.25	122.3	1540	28.9	445.	Good	1 3/16	39	173.55	38.32	211.87	3	21
Lone Star-132	92.00	107.9	1359	28.4	385.9	Good	1⅛ full	37	142.78	34.09	176.87	21	25
Lone Star-132-48	93.75	110.9	1397	30.3	422.2	Good	1 3/16	39	164.65	34.12	198.77	5	28
Unknown	96.00	102.2	1287	29.4	378.3	Good	1 3/16 full	41	155.10	31.81	186.91	13	24
Columbia (U. S. D. A.)	64.75	70.6	889	28.1	249.8	Good	1¼	43	107.41	22.40	129.81	33	27
Columbia (Sherard)	94.75	97.6	1229	28.2	346.5	Good	1 3/16 full	41	142.06	34.40	176 46	22	24
Webber-82	92.75	96.2	1212	29.9	362.3	Good	1 5/16	45	162.93	29.75	192.68	10	27
Foster-120	94.25	104.3	1314	30.9	406.	Good	1 3/16 full	41	166.46	31.78	198.24	7	30
Foster-120-449	83.25	100.6	1267	31.7	401.6	Good	1 3/16	39	156.62	30.31	186.93	12	24
Sunflower	80.50	82.6	1040	28.0	291.2	Good	1⅜	47	136.86	27.21	164.07	27	19
Kekchi	82.00	94.5	1190	31.8	378.4	Good	1 3/16 full	41	155.14	28.42	183 56	15	25

Culture. The variety cottons were grown on land of moderate fertility. No fertilizers were used. They were planted April 18 and 19, but as the soil was dry, they came up rather irregularly. A fair stand of the small seeded varieties was secured in a week after planting. The other varieties were re-planted with hoes and finally a good stand of all varieties was secured. The regular thinning and cultivation practices recommended by the Experiment Station were followed.

Diseases. A fungus disease attacked the young seedlings of most varieties and injured the stand in spots, but the total damage was not great. Wilt or blight also attacked several varieties later in the season. The ones injured most were Simpkins, Trice, Lone Star-132, Lone Star-132-48, Foster-120, Foster-120-449, and Kekchi.

There was much shedding during July at different times. This was caused apparently by abrupt changes in soil moisture conditions.

Boll Weevil. The first punctured squares in the plots were found June 27. Weevil work increased gradually during July. On July 16 there was 4% infestation. By August 20, weevils were plentiful enough practically to stop flowering, and none of the forms that blossomed after August 15 made cotton.

Yield. The yields shown in tables 2 and 3 are better than those secured the two years previous. The gain was due chiefly to a lighter weevil infestation in 1917.

GOOD VARIETIES FOR EAST AND CENTRAL MISSISSIPPI

The results of studies made the past year in three different tests, namely, at the College Station on valley land, at the College Station on hill land, and at Strongs, Monroe County, have not changed our notions in regard to varieties most suitable for planting in the eastern and central parts of Mississippi. The following is quoted from our 1916 report: "It is not safe, however, to judge the merits of a variety from one year's testing. The medium early big boll varieties like Wannamaker-Cleveland, Cleveland Big Boll, and Miller have made a good showing in a number of tests each year for several years; consequently, we are inclined to think that they are excellent varieties for the hill portion of the State. These varieties are vigorous growers, are fairly resistant to disease, have a good percentage of lint and a staple of good length for a short cotton. Express has, during the past three years, made a good showing on valley land, and we are inclined to think that no other cotton will do better on valley land under heavy boll weevil infestation. Trice ranks next in value to Express for the conditions just mentioned. On very rich land that is free from wilt, Trice will probably yield better than Express, Wannamaker-Cleveland, Cleveland Big Boll, or Miller."

TABLE 3—RESULTS FROM COTTON VARIETY STUDIES ON HILL LAND, COLLEGE STATION, 1917

VARIETY	Lbs. of seed cotton per plat	Lbs. of seed cotton per plat for perfect stand	Lbs. of seed cotton per acre for perfect stand	Per cent lint	Lbs. of lint per acre	Character of staple	Length of staple in inches	Value of lint per lb. in cents	Value of lint	Value of seed @ $70 a ton	Total money value	Rank in money value
Dodds' Prolific	34.75	37.6	582	30.4	177.0	Fair	1 1/16	31½	$ 55.74	$ 14.17	$ 69.91	12
Trice (Tenn Station)	24.25	27.2	421	29.9	125.8	Good	1 1/16 full	33½	42.14	10.36	52.50	14
Cleveland (Wannamaker)	37.25	42.4	657	35.6	233.8	Good	1 full	31½	73.64	14.84	88.48	6
Cleveland Big Boll	35.00	48.6	753	33.2	249.9	Good	1 1/16	32	78.96	17.64	96.60	4
Improved Cook	34.75	40.0	620	34.9	216.3	Good	1	31	66.95	14.14	81.09	8
Triumph	27.25	29.6	458	37.6	172.2	Good	1 1/16 full	33½	57.68	10.01	67.69	13
Miller	40.75	48.8	756	33.4	253.1	Good	1 1/8	35	88.58	17.60	106.18	1
Sproull	36.00	38.4	595	31.2	185.6	Fair	1 1/16 full	33	61.24	14.35	75.59	11
Lone Star-11	31.50	46.4	715	34.2	244.5	Good	1 1/8	35	85.57	16.48	102.05	2
Lone Star-132	32.50	45.6	706	28.4	200.5	Good	1 1/8 full	37	74.18	17.71	91.89	5
Express-350	41.25	48.8	756	28.0	211.7	Good	1 3/16	39	82.56	19.07	101.63	3
Express-32	33.00	40.8	632	28.0	177.0	Fair	1 3/16	38½	68.14	15.92	84.06	7
Unknown	28.50	35.2	545	29.4	160.2	Good	1 3/16 full	41	65.68	13.30	78.98	9
Foster-120	27.00	33.6	520	30.9	160.6	Good	1 3/16 full	41	65.84	12.60	78.44	10

In 1917, in each of the three tests mentioned above, Express made a good showing under moderate weevil infestation. Several of the new strains originated by the Experiment Station continue to rank well in comparative tests. Seed of some of these, namely, Foster-120, Express-122, and Express-350, have been distributed. Seed of other promising strains will be multiplied as soon as possible and distributed.

STUDY OF WILT RESISTANCE, COLLEGE STATION, 1917

In 1917, we secured seed of several of the best wilt-resistant varieties that have been developed in Georgia and Alabama, and planted them along with seed from some of our leading non-wilt resistant varieties. Table 4 is a summary of the test.

TABLE 4—STUDY OF WILT RESISTANCE, COLLEGE STATION, 1917

VARIETY	Lbs. of seed cotton per acre	Per cent lint	Pounds of lint per acre	Character of staple	Length of staple in inches	Value of lint per lb. in cents	Value of lint	Value of seed @ $70 a ton	Total money value per acre	Per cent of healthy plants	Per cent of plants infected and slightly damaged	Per cent of plants killed or badly injured	Rank in money value
Trice	612	29.9	182.9	Good	1 1/16 full	33 1/2	$ 61.27	$ 15.05	$ 76.32	3.2	16.5	80.3	11
Improved Dixie	837	30.2	252.7	Good	1	31	78.33	20.47	98.85	55.7	15.4	28 9	8
Wannamaker-Cleveland	906	35.6	322.5	Good	1 full	31 1/2	101.58	20.44	122.02	37.3	30.8	31.9	3
Tri-Cook	1030	33.8	348.1	Good	1	31	107.91	23.87	131.78	67.1	24.6	12.3	1
Cook 307-6	767	33.6	257.7	Fair	7/8	30	77.31	17.85	95.16	63.2	31.9	4.9	9
Express-350	782	28.	218.9	Good	1 3/16	39	85.37	19.79	105.16	26.7	20.0	53.3	6
Dix-Afifi	767	29.9	229.3	Fair	1 3/16	38 1/2	88.28	18.83	107.11	79.2	13.3	7.5	5
Lewis-63	1030	32.9	338.8	Fair	1	30 1/2	103.33	24.22	127.55	88.7	4.6	6.7	2
Covington-Toole	713	34.3	244.5	Fair	7/8	30	73.35	16.41	89.76	81.5	8.8	9.7	10
Council-Toole	844	29.9	252.3	Good	1	31	78.21	20.72	98.93	77.6	12.5	9.9	7
DeSoto	937	29.9	280.1	Fair	1	30 1/2	85.43	22.99	108.42	76.8	12.3	10.9	4

As will be seen from the above table, the yields were fairly good. Tri-Cook from the Alabama Station, which is a hybrid between Triumph and Cook, and Lewis-63, developed by A. C. Lewis, of Georgia, led in yields. These varieties are very wilt-resistant and seem to be of considerable value. However, we doubt if they will produce as well as Wannamaker-Cleveland under heavy weevil infestation, especially if the soil is not badly infected with wilt. Weevils were not numerous in these plots until fairly late in the season, and too, the stand of Wannamaker-Cleveland lacked a good deal of being as good as that of the two varieties which led in yield. Dix-Afifi is the most wilt-resistant staple variety known to the writer. It resembles Dixie in vegetative characters. In fact, nearly all of the wilt-resistant varieties resemble one another and are of the Peterkin type.

All varieties had some plants infected by the wilt organism, the percentage being low in the case of the resistant varieties and rather high for the others.

DISTANCE WORK

In continuation of the distance work which has been carried on by the College Station for the past nine years, twenty 5-row plots were planted in Express cotton the past season with rows 3½ feet apart. A good stand was secured. Cotton was thinned at the regular time for thinning to the theoretical distance of four, eight, sixteen, and twenty-four inches. Where there were short skips more than one plant was left in a place. A count of the total number of plants in the plots at picking time showed that the average space for plants in each plot was considerably less than the theoretical the actual space being 2.7, 4.5, 6.8, and 9.3 inches respectively. The hills were not closer than the theoretical distance. The difference was due to the fact that more than one plant was left to a hill in a good many instances. Two plants in one hill will not produce as much as two plants some distance apart, and so are not equivalent.

A count of the blossoms on adjoining rows two or three times during the blooming season showed that the closest spaced rows were producing about twice as many flowers per day as the widest spaced ones. The shedding rate was, of course, considerably higher for the closer spacing.

The yields shown by the following table are in accord with results obtained other years with other varieties. Closer spacing continues to give higher yields.

TABLE 5—DISTANCE TEST

4 inches	898 lb. seed cotton per acre
8 inches	880 lb. seed cotton per acre
18 inches	783 lb. seed cotton per acre
24 inches	713 lb. seed cotton per acre

SINGLE STALK COTTON CULTURE

"Single Stalk Cotton Culture," as advocated by Cook of the Bureau of Plant Industry, U. S. Department of Agriculture, was described in some detail in Bulletin No. 178, Mississippi Experiment Station, and the results obtained from a year's testing under Mississippi conditions were given. These results indicated that cotton thinned late according to the Single Stalk Culture system would produce higher yields. However, it was suspected that the higher yields might be due to closer spacing rather than to late thinning, since the Single Stalk Culture plots were spaced 6 inches in the drill and the check plots 8 to 12 inches. In 1917, an effort was made to get some light on this point. Sixteen 5-row plots were planted with Express seed. An excellent stand was secured. Half of the plots were thinned at the regular time in May, while the others were not thinned until June 7, which was about seventeen days after the first plots were thinned. Both series of plots were thinned to six inches in the drill. All the rows in a plat were thinned alike, but only the three middle rows of each plat were used in getting data,—weights, number of flowers produced, etc.

Both sets of plots were flowering on the same date. Counts were made on half the plots of each kind. On June 28, the first day a count was made, the regular thinned rows had eight blossoms, while the late thinned ones had seven. Counting was continued until July 21. At that time the regular thinned rows had produced 3,833 blossoms, while corresponding rows in the other plots had produced 3,659 flowers.

The rows thinned at the regular time yielded 933.7 pounds of seed cotton per acre, while the ones thinned late yielded 860.1 pounds, a difference of 73.6 pounds in favor of the early thinning. This seems to indicate that it is the close-spacing feature of the Single Stalk Culture system that is instrumental in producing better yields rather than the late thinning. At least, such appeared to be the case under conditions prevailing where this test was conducted.

Results from the Delta Station, 1917

During the season of 1917 cotton breeding, acclimatization work, and variety testing were continued at the Delta Branch Station. Cold rainy weather during the month of April interferred with planting and retarded the growth of young plants. Many seedling plants died after coming up. It will be safe to say that the crop was set back at least two weeks by the unfavorable weather conditions, and was later coming into flower than for several years. Following the wet weather of April came a drouth extending through May, June, and July. This retarded vegetative growth and produced low plants. However, the dry weather was helpful in that it served to check the multiplication of boll weevils. No weevils were found in the plots until August, and did not become plentiful enough to stop flowering until the 25th of August. The yields obtained in 1917 were better than those secured the two preceding seasons. This was due to less weevil damage.

VARIETY STUDIES AT DELTA STATION, 1917

Having more strains and varieties to plant than could be tested satisfactorily in one plat, two were used, the long staple varieties being planted in one and short in another. A few varieties, namely, Wannamaker-Cleveland, Trice (from Tennessee), Express-350, Foster-120, and Lone Star-132, were planted in both tests. By comparing the yields of these varieties in the two tests it is possible to get an idea of the relative productiveness of the soil in the two plots. The short staple test was planted April 12 and the long staple test April 17. A fairly good stand was secured in both tests. At picking time all skips were measured accurately, and allowance was made for them in computing yields. Thus the figures on acre yields in the tables are on the basis of a perfect stand for each variety.

VARIETY	Lbs. of seed cotton per plat	Lbs. of seed cotton per plat for perfect stand	Lbs. of seed cotton per acre for perfect stand	Per cent lint	Lbs. of lint per acre	Character of staple	Length of staple in inches	Value of lint per lb. in cents	Value of lint per acre	Value of seed @ $70 per ton	Total money value	Weight of 100 bolls in ounces	Rank in money value
Trice (Tenn. Station)	88.50	90.1	1747	30.3	529.3	Fair	1	30½	$ 161.43	$ 42.77	$ 204.20	22	29
Wannamaker-Cleveland	94.50	100.9	1958	37.	724.4	Good	1 full	31	224.56	43.19	267.75	24	4
Lone Star-132	89.75	93.8	1819	28.9	525.6	Fair	1⅛ full	36½	191.84	45.29	237.13	24	21
Lone Star-132-48	86.00	90.5	1755	31.8	558.	Fair	1 3/16	38½	214.83	41.89	256.72	28	9
Express-350	96.50	100.4	1947	29.4	572.4	Fair	1⅛ full	36½	208.92	48.12	257.04	22	8
Express-122	95.00	98.9	1908	28.8	549.5	Good	1 3/16	39	214.30	47.56	261.86	20	7
Express-122-433	99.75	105.0	2037	29.2	594.8	Fair	1 3/16	38½	228.99	50.50	279.49	22	3
Express-412	97.50	99.2	1924	29.6	569.4	Fair	1 3/16	38½	219.21	47.42	266.63	22	5
Express-432	103.00	105.1	2038	32.8	668.4	Fair	1⅛ full	36½	243.96	47.95	291.91	22	1
Express-341	91.50	96.1	1864	30.8	574.1	Poor	1⅛ full	36	206.67	45.15	241.82	20	17
Express (Low's)	93.00	96.5	1872	28.0	524.1	Poor	1⅛	34	178.19	47.18	226.37	22	25
Black Rattler	72.25	73.7	1429	27.5	392.9	Good	1 3/16	39	153.23	36.76	189.99	18	31
Columbia X Express B-32	84.25	91.1	1767	31.9	563.6	Poor	1⅛ full	36	202.89	42.14	245.03	26	14
Columbia (U. S. D. A.)	70.75	73.3	1422	30.2	429.4	Good	1 3/16 full	41	176.05	34.75	210.80	27	27
Columbia (Sherard's)	82.25	83.9	1627	32.2	523.8	Fair	1 3/16 full	40½	212.13	38.64	250.77	27	13
Polk	88.75	90.4	1753	29.3	513.6	Good	1 3/16 full	41	210.57	43.40	253.97	22	11
Unknown	84.00	87.0	1688	30.9	521.5	Fair	1 3/16	38½	200.77	40.34	241.11	25	20
Magnolia	97.25	99.7	1916	27.9	534.5	Fair	1 3/16	38½	205.78	48.37	254.15	24	10
Foster-120	76.00	81.3	1577	30.3	477.8	Good	1 3/16	41	195.89	38.50	234.39	27	24
Foster-11	84.25	90.6	1757	31.3	550.0	Fair	1 3/16	40½	222.75	42.24	264.99	27	6
Webber-82	80.50	83.1	1612	30.9	498.1	Good	1¼	43	214.18	38.99	253.17	28	12
Webber-49	89.50	97.3	1887	30.5	575.5	Good	1 3/16 full	41	235.95	45.92	281.87	25	2
Sunflower	82.75	84 8	1645	27.7	455.6	Fair	1 5/16	44½	202.74	41.65	244.39	21	15
Panther Burn	82.50	85.5	1658	27.3	452.6	Fair	1 5/16	44½	201.41	42.21	243.62	19	16
Allen's Long Staple	80.25	83.0	1610	28.0	450.8	Fair	1 5/16	44½	200.88	40.60	241.48	22	19
Osceola	76.00	77.8	1509	28.2	425.5	Good	1 3/16	39	165.94	37.94	203.88	22	30
Adair No. 1	71.25	72.7	1410	26.1	368.0	Fair	1⅜	47	172.96	36.47	208.43	19	28
Baird	78.50	82.8	1606	27.9	448.0	Fair	1 3/16 full	40½	181.44	40.53	221.97	23	26
Scott	78.50	81.8	1586	27.0	428.2	Good	1⅜	47	201.25	40.53	241.78	23	18
Kekchi	81.00	83.1	1612	31.7	511.0	Fair	1 3/16	38½	196.73	38.53	235.26	25	22
Dix-Afifi	86.00	87.2	1690	29.7	501.6	Fair	1 3/16	38½	193.11	41.61	234.72	21	23
Sea Island	17.50	18.1	351	26.3	92.3	Good	1½	65	59.99	9.06	69.05	13	32

TABLE 7—SHORT STAPLE VARIETY STUDIES, DELTA BRANCH STATION, 1917

VARIETY	Lbs. of seed cotton per plat	Lbs. of seed cotton per plat for perfect stand	Lbs. of seed cotton per acre for perfect stand	Per cent lint	Lbs. of lint per acre	Character of staple	Length of staple in inches	Value of lint per lb. in cents	Value of lint	Value of seed @ $70 per ton	Total money value per acre	Weight of 100 bolls in ounces	Rank in money value
Dodds' Prolific	127.25	128.80	1468	30.6	449.2	Fair	1 1/16	31½	$ 141.49	$ 32.16	$ 173.65	22	18
Trice (from Tenn. Sta.)	125.50	128.00	1459	30.3	442.	Fair	1	30½	134.81	35.59	170.40	22	19
Trice-271-43	155.00	161.40	1839	31.3	575.6	Fair	1	30½	175.55	43.89	219.44	20	4
Trice-270-41	144.25	146.25	1664	30.9	514.1	Good	1 1/16 full	33½	172.22	40.25	212.47	22	7
Dat So Improved	132.50	138.00	1573	28.4	446.7	Good	1 1/8	35	156.34	39.44	195.78	22	12
Wannamaker-Cleveland	141.75	147.84	1685	37.3	628.5	Fair	7/8	30	188.55	36.99	225.54	26	1
Cleveland-43	136.75	143.36	1636	33.2	543.1	Good	1 1/16 full	33½	181.93	37.90	219.83	34	3
Cleveland Big Boll	114.00	132.16	1506	33.9	510.5	Good	1 1/16	32	163.36	34.86	198.22	30	11
Improved Cook	113.00	118.70	1353	35.7	482.9	Good	7/8	30½	147.28	30.48	177.76	26	15
Triumph	98.25	107.40	1224	36.8	445.5	Good	1 1/16 full	33½	149.24	27.26	176.50	32	16
Miller	87.75	111.10	1266	34.1	431.7	Fair	1 1/8	34½	148.93	29.22	178.15	36	14
Rowden	92.25	104.20	1187	33.8	401.2	Good	1 1/16 full	33½	134.40	27.51	161.91	34	20
Sproull's Big Boll	117.25	124.00	1413	32.4	457.8	Good	1 1/16 full	33½	153.36	33.46	186.82	30	13
Lone Star-15	126.25	131.25	1496	36.0	538.5	Good	1 1/16	32	173.32	33.53	206.85	28	9
Lone Star-132	141.25	147.84	1685	28.8	485.2	Fair	1 1/8	34½	167.31	42.00	209.31	24	8
Lone Star X Express A-311	81.00	140.00	1600	31.3	500.8	Fair	1 1/8 full	36½	182.79	38.50	221.29	28	2
Foster-120-449	120.75	123.20	1412	31.1	439.1	Fair	1 3/16	38½	169.05	34.05	203.10	26	10
Foster-120	92.50	104.30	1189	31.3	372.1	Good	1 3/16	39	145.11	28.59	173.70	26	17
Express-350	136.00	140.10	1597	28.8	459.9	Good	1 3/16	39	179.36	39.83	219.19	22	5
Express-435	139.75	148.96	1698	28.1	477.1	Poor	1 1/8 full	36	171.75	42.73	214.48	18	6

GOOD VARIETIES FOR THE DELTA DISTRICT FOR GROWING UNDER HEAVY WEEVIL INFESTATION

In our opinion, Express, especially some of the better strains, is the most profitable cotton for Delta conditions in general. It is fairly disease resistant, extra early and prolific, and its staple commands a good premium. Webber-49 made a splendid showing in our tests in 1917, and is a promising variety for this region. Among the short staple varieties Trice and Wanamaker-Cleveland seem to have the lead. Trice is best on extra rich land that is free from wilt.

Variety Studies at Strongs, Monroe County, Mississippi, 1917

Since the black soils of the Northwest Prairie belt are of a type somewhat different from other soils on which variety tests have been made in previous years, it was thought well to make a test in that region. W. T. Donaldson kindly agreed to furnish land for a test on his plantation near Strongs, and his son, W. T. Donaldson, Jr., under the direction of the writer planted, cultivated, and picked the crop. The land used was fairly fertile. Weevils became plentiful enough to stop blossoming about the middle of August. Express-314 proved to be a hybrid and is therefore not a good representative of the variety. The main results of the test are shown in table 8.

TABLE 8—VARIETY STUDY AT STRONGS, MONROE COUNTY, 1917

VARIETY	Seed cotton per acre	Per cent lint	Lbs. of lint per acre	Length of staple in inches	Value of lint per lb in cents	Value of lint	Value of seed @ $70 a ton	Total money value	Rank in money value
lice (Local Strain)	1267	29.9	378.8	1 1/16	32	$121.02	$31.11	$152.13	10
lice (U. S. D. A.)	1372	29.9	410.2	1 1/16 full	33 1/2	137.41	33.67	171.08	7
annamaker-Cleveland	1161	35.6	413.3	1 full	31 1/2	130.18	26.18	163.59	8
ller	1320	33.4	440.8	1 1/8	35	154.28	30.80	185.08	4
ne Star-11	1320	34.2	451.4	1 1/8	35	157.99	30.41	188.40	3
ne Star-132	1716	28.4	487.3	1 1/8 full	37	180.30	43.01	223.31	1
lk	1161	29.4	341.3	1 3/16	39	133.10	28.70	161.80	9
press-314	1293	29.6	382.7	1 1/8 full	36 1/2	139.68	31.88	171.56	6
ster-120	1452	30.9	448.6	1 3/16 full	41	183.92	35.14	219.06	2
lumbia	1267	28.1	356.	1 1/4	43	153.08	31.88	184.96	5

Variety Studies at Clarksdale, 1917

Table 9 shows the main results from a variety trial made on the plantation belonging to Mullens and Lacy, about five miles north of Clarksdale, in the northern part of the Yazoo Delta. The land on

which the test was conducted was of a buckshot type and only moderately fertile. Cold, wet weather retarded the crop considerably early in the season, and the boll weevil did considerable damage later; consequently, the yields are below average for that plantation.

TABLE 9—VARIETY STUDIES AT CLARKSDALE, 1917

VARIETY	Lbs. of seed cotton per acre	Per cent lint	Length of staple in inches	Lbs. of lint per acre	Value of lint per lb in cents	Value of lint per acre	Value of seed @ $70 a ton	Total money value per acre	Rank in money
Trice	891	30.3	1	269.9	30½	$ 82.32	$ 21.73	$104.05	
Wannamaker-Cleveland	977	37.3	1 full	364.4	31	112.96	20.45	133.41	
Miller	972	34.1	1⅛	331.4	34½	114.33	22.43	136.76	
Lone Star-11	918	34.9	1 1/16 full	320.3	33½	107.20	20.93	128.13	
Lone Star-132	1143	28.9	1⅛ full	330.3	36½	120.55	28.45	149.00	
Express-341	1053	30.8	1⅛ full	324.3	36	116.74	25.51	142.25	
Express-350	878	29.4	1⅛ full	258.1	36½	95.20	21.70	116.90	
Express-122	819	28.8	1 3/16	235.8	39	91.96	20.44	112.40	
Polk	761	29.3	1 3/16 full	222.9	41	91.38	18.86	110.24	
Durango	497	31.	1 3/16	154.	39	60.06	12.00	72.06	
Columbia	495	30.2	1 3/16 full	149.5	41	61.29	12.11	73.40	
Foster-120	861	30.3	1 3/16	260.8	41	106.92	21.00	127.92	
Mitchell	445	27.5	1½	122.3	55	67.26	11.30	78.56	

Results from the Holly Springs Branch Station Variety Test, 1917

On Valley Land. The cotton in the test on valley land was planted April 21. On account of the cold, dry spring it was found necessary to plant over May 11. This planting germinated about the first of June. A mixture of 100 pounds of cottonseed meal and 300 pounds of acid phosphate to the acre was used in the drill. One fifteenth acre of each variety was planted in five 1-row plots, rows 4 feet apart, plants 12 inches in the drill. The stand secured was not satisfactory.

A few weevils were found during the latter part of July, and weevils did considerable damage the latter part of the season. The early frost in October did far more damage than the weevil, destroying about one-third of the crop.

The extra early varieties made the heaviest yields. Of the varieties of which there is seed available in the market, the following are mentioned as good varieties for the Holly Springs district: for hill land, Wannamaker-Cleveland, Miller, Cleveland Big Boll, and Triumph; for valley land, Wannamaker-Cleveland, Trice, Unknown, and Express. Unknown and Express are staple varieties.

Table 10 shows the main results from the test on valley land.

TABLE 10—VARIETY STUDIES AT HOLLY SPRINGS BRANCH STATION, 1917

VARIETY	Date of Pickings: October 11th	Date of Pickings: November 5th	Total per plat	Lbs. of seed cotton per acre	Per cent lint	Lbs of lint per acre	Character of staple	Length of staple in inches	Value of lint per pound in cents	Total value of lint	Value of seed @ $70 a ton	Total money value	Rank in money value
Dodds' Prolific	33.7	34.7	68.5	1058.2	30.8	325.9	Good	1⅛	35	$ 114.01	$ 25.63	$ 139.64	12
Trice (Tenn. Station)	49.5	44.2	93.7	1044.8	28.9	301.9	Fair	1 1/16	31½	95.09	26.00	121.09	17
Trice-270-41	51.5	49.5	101.0	1557.4	30.1	468.7	Good	1⅛ full	37	173.41	38.10	211.51	1
Cleveland Big Boll	16.7	42.0	58.7	905.7	33.9	307.0	Fair	1 1/16	31½	96.70	20.95	117.65	20
Wannamaker-Cleveland	20.0	44.5	64.5	994.6	35.1	349.1	Good	1 full	31½	109.96	22.59	132.55	14
Cook's Improved	15.7	41.0	56.7	874.0	34.7	303.2	Fair	⅞	30½	92.47	19.97	112.44	21
Triumph	19.5	43.0	62.5	963.7	35.8	345.0	Good	1⅛	35	120.75	21.65	142.40	11
Sproull's Big Boll	17.0	35.2	52.2	804.9	31.2	251.1	Fair	1⅛	34½	86.62	19.38	106.00	22
Lone Star-11	33.7	41.0	74.4	1151.8	34.3	395.0	Fair	1⅛ full	36½	144.17	26.48	170.65	3
Lone Star-15	29.5	43.0	72.5	1117.9	35.5	396.8	Fair	1⅛ full	36½	144.83	25.23	170.06	5
Miller	17.0	46.0	63.0	971.5	33.2	322.5	Good	1⅛ full	35	112.87	22.71	135.58	13
Rowden	17.2	43.0	60.2	928.2	32.3	299.8	Fair	1⅛	34½	103.43	21.99	125.42	15
Lone Star-132	32.5	36.7	69.2	1067.8	28.3	302.1	Good	1 3/16	39	117.81	26.79	144.60	10
Express-32	47.2	35.0	82.2	1267.5	28.4	359.9	Fair	1 3/16	38½	138.56	31.76	170.32	4
Express-122	43.5	33.5	77.0	1187.3	27.3	324.1	Good	1 3/16	39	126.39	30.21	156.60	8
Express-350	50.5	40.0	90.5	1395.5	28.4	396.3	Good	1 3/16	39	154.55	34.97	189.52	2
Polk	22.7	32.2	55.0	848.1	29.1	246.7	Good	1 3/16 full	41	101.14	21.04	122.18	16
Unknown	40.0	39.2	79.2	1221.2	29.0	354.1	Fair	1 3/16	38½	136.32	30.34	166.66	6
Foster-120	28.7	39.0	67.7	1044.7	30.7	320.7	Fair	1 3/16 full	40½	129.88	25.34	155.22	9
Foster-120-437	27.0	45.7	72.7	1121.8	31.5	353.3	Good	1 3/16	39	137.78	26.89	164.67	7
Columbia (Sherard)	10.0	46.7	55.7	859.6	28.3	243.2	Fair	1 3/16 full	40½	98.49	21.57	120.06	19
Columbia (U. S. D. A.)	9.0	32.0	41.0	632.2	28.2	178.2	Good	1 5/16	45	80.19	15.89	96.08	23
Webber-82	14.0	38.0	52.0	801.0	29.1	233.0	Good	1¼	43	100.19	19.88	120.07	18

On Hill Land. Results will be seen in table 11. Six 1-row plats, approximately 1/20 acre for each variety were planted May 4 in 4-foot rows, with plants 12 inches in the row. Ten tons of manure were broadcasted on the land prior to preparation, and a mixture of 300 pounds acid phosphate and 100 pounds cottonseed meal to the acre was used in the drill. The cotton on this set of plots grew off better, and the results are nearer what should be expected than any planting made. Both weevil and the early frost reduced the yield materially.

TABLE 11.—VARIETY TEST ON HILL LAND, 1917

VARIETY	Dates of Picking		Total per Plot	Lbs. of seed cotton per acre
	Oct. 11	Nov. 12		
Trice-270-41	49.2	20.0	69.2	1384
Wannamaker-Cleveland	39.7	21.7	61.5	1230
Cleveland Big Boll	42.5	20.7	63.2	1264
Express-350	53.	18.5	71.5	1430
Sproull's Big Boll	29.7	25.0	54.7	1094

TWELVE YEARS' RESULTS WITH FERTILIZERS UNDER COTTON

Remarks. The land used in the fertilizer tests was brown loam hill land. Plats contained 1/20 acre each and occupied the relative positions shown in tables 12 and 13. The two sets of plats were separated by a six-foot space. The no-fertilizer plots show the amount of natural soil variation. In nine years out of the twelve, 200 pounds of acid phosphate to the acre more than doubled the yield of the plots not fertilized.

In every instance during the twelve years, except where potash alone was used, fertilizing paid well for the investment. The use of both phosphorous and nitrogen, either alone or in combination, has given very satisfactory results. Phosphorous (chiefly acid phosphate) hastens maturity. Valley land that is slow maturing a crop can be greatly benefitted by its use. A liberal application of acid phosphate on land where a legume has been turned under, such as lespedeza, crimson clover, etc., gives very satisfactory results.

On thin upland an equal mixture of cottonseed meal, or an equivalent of nitrogen in some other form, and acid phosphate at the rate of from 200 to 300 pounds to the acre is highly recommended. All of the fertilizer should be applied at one time and preferably under the seed about two weeks before planting time.

TABLE 12—TWELVE YEARS' RESULTS WITH FERTILIZERS UNDER COTTON

Yield of Seed Cotton When 200 lbs. Fertilizer per Acre Was Used.

Plat No.	Fertilizers	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	12 Yrs Ave
1.	No Fertilizers	520	860	820	310	300	400	300	200	570	350	590	390	467
2.	200 lbs. Cottonseed Meal	680	1140	1240	615	900	885	600	530	940	700	960	780	831
3.	200 lbs. Acid Phosphate	1180	1200	1420	690	1060	1020	670	760	1160	880	840	740	968
4.	200 lbs. Kainit	520	940	890	460	470	600	460	330	760	590	580	540	595
5.	No Fertilizers	560	860	790	365	290	480	320	230	650	500	680	530	502
6.	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	980	1140	1240	615	1160	985	730	730	1110	830	880	800	933
7.	100 lbs. Cottonseed Meal 100 lbs. Kainit	640	880	1000	550	800	760	620	460	760	740	680	620	709
8.	100 lbs. Acid Phosphate 100 lbs. Kainit	960	980	1100	625	910	845	700	580	950	670	860	600	815
9.	120 lbs. Acid Phosphate 40 lbs. Cottonseed Meal 40 lbs. Kainit	1040	1030	1230	670	800	680	680	630	940	590	540	580	784
10.	No Fertilizer	600	760	820	340	250	500	230	240	560	360	460	460	465
11.	150 lbs. Cottonseed Meal 50 lbs. Acid Phosphate	940	900	1120	580	820	720	510	640	930	430	640	710	745
12.	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	940	820	1190	630	810	760	580	660	990	570	640	625	768
13.	50 lbs. Cottonseed Meal 150 lbs. Acid Phosphate	800	1120	1210	660	800	620	620	580	840	600	480	660	749
14.	No Fertilizer	660	690	910	330	340	400	320	200	540	420	290	320	452

TABLE 13—TWELVE YEARS' RESULTS WITH FERTILIZERS UNDER COTTON

Yield of Seed Cotton When 400 Lbs. Fertilizer per Acre Was Used.

Plat No.	Fertilizers	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	12 Yr. Ave.
1½	No Fertilizer	420	580	560	260	.....	.....	.....	.....	580	340	540	400	460.
2½	400 lbs. Cottonseed Meal	780	780	920	470	.....	.....	.....	.....	670	540	920	640	715.
3½	400 lbs. Acid Phosphate	850	940	1070	425	.....	.....	.....	.....	1340	860	820	750	882.
4½	400 lbs. Kainit	420	780	790	400	.....	.....	.....	.....	640	390	600	565	573.
5½	No Fertilizer	540	800	650	230	.....	.....	.....	.....	420	430	765	600	554.
6½	200 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	1120	1160	1540	910	1186	1245	880	520	1310	870	1000	940	1057.
7½	200 lbs. Cottonseed Meal 200 lbs. Kainit	760	1080	1180	660	830	1000	730	620	1060	900	790	765	864
8½	200 lbs. Acid Phosphate 200 lbs. Kainit	1180	1200	1460	700	1030	945	750	730	1040	740	680	500	913.
9½	240 lbs. Acid Phosphate 80 lbs. Cottonseed Meal 80 lbs. Kainit	1218	1270	1570	840	1050	1025	780	610	1190	760	610	590	959.
10½	No Fertilizer	520	850	920	250	200	340	270	210	540	350	460	440	446.
11½	300 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	1040	1170	1650	850	940	1000	820	1000	1280	760	940	1000	1038.
12½	200 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	1040	1180	1680	830	1000	1030	700	780	1010	720	760	970	975.
13½	100 lbs. Cottonseed Meal 300 lbs. Acid Phosphate	760	1060	1080	600	670	850	500	560	930	490	450	660	718.
14½	No Fertilizer	700	.....	.....	430	450	340	380	280	500	360	260	410	411.

SPACING EXPERIMENT, 1917

This test was conducted on hill land that had carried a light growth of lespedeza for five years. One hundred pounds of cottonseed meal and 200 pounds of acid phosphate to the acre were used as fertilizer. Cotton was planted April 28, and was very slow in germinating, on account of cold, dry weather. Boll weevils appeared in the latter part of July and did some damage. Early frosts cut the crop about 40 per cent. The stand in these plots was rather poor, and the space desired was not always obtained; therefore, the results are not conclusive.

TABLE 14—SPACE EXPERIMENT, 1917

VARIETY	Width of row	Distance in drill	First picking Oct. 17	Last picking Nov. 10	Total yield per plat	Total seed cotton per acre
Wannamaker-Cleveland	3.0 ft.	9 in.	7.2	6.0	13.2	594.0
Cleveland Big Boll	3.0 ft.	9 in.	8.7	6.5	14.5	652.5
Columbia (Sherard)	3.0 ft.	9 in.	5.0	4.0	9.0	405.0
Wannamaker-Cleveland	3.5 ft.	12 in.	7.0	6.0	13.0	502.5
Cleveland Big Boll	3.5 ft.	12 in.	6.7	6.0	12.7	490.9
Columbia	3.5 ft.	12 in.	3.5	5.2	8.7	338.2
Wannamaker-Cleveland	4.0 ft.	16 in.	11.5	8.0	18.5	625.5
Cleveland Big Boll	4.0 ft.	16 in.	8.7	6.5	15.5	513.9
Columbia	4.0 ft.	16 in.	4.0	7.5	11.5	388.8
Wannamaker-Cleveland	4.0 ft.	9 in.	9.5	8.5	18.0	609.5
Cleveland Big Boll	4.0 ft.	9 in.	9.5	9.5	19.0	642.6
Columbia	4.0 ft.	9 in.	5.5	7.0	12.5	422.6
Wannamaker-Cleveland	4.0 ft.	6 in.	11.0	13.0	23.0	777.6
Cleveland Big Boll	4.0 ft.	6 in.	11.2	12.0	23.2	786.0
Columbia	4.0 ft.	6 in.	12.5	10.0	20.5	693.1
Wannamaker-Cleveland	3.0 ft.	16 in.	11.5	12.0	23.5	1057.5
Cleveland Big Boll	3.0 ft.	16 in.	10.5	10.0	20.5	922.5
Columbia	3.0 ft.	16 in.	6.5	8.0	14.5	652.5
Wannamaker-Cleveland	3.5 ft.	12 in.	17.2	9.0	26.2	1012.6
Cleveland Big Boll	3.5 ft.	12 in.	11.5	10.0	21.5	831.0
Columbia	3.5 ft.	12 in.	5.5	8.0	14.5	560.4

General Discussion

RAPIDITY AND AMOUNT OF FLOWERING

There is considerable difference between different varieties in the rapidity with which they flower, and a wide difference, too, in the total number of flowers they produce. This is a matter of considerable importance, especially in weevil infested territory. In general, the variety that is able to produce and support the most flowers during the first part of the fruiting season is the most satisfactory variety. There are, however, several factors that modify this rule. Some varieties have bolls much larger than others. The big boll varieties need not produce so many flowers to yield a given quantity of cotton. There is considerable difference in the lint per cent of different varieties; to yield a given quantity of lint a variety with a high lint per cent need not produce as many flowers as one with a low per cent. There is difference, too, in the shedding rate of different varieties. The precocious early varieties, like Trice, usually shed more than varieties that are a little later. They seem to put on a good many more forms than they are able to support. From the economic standpoint there is a difference in the value of varieties due to difference in length of lint. These values, of course, vary in different years.

Our flowering studies in 1917 showed that the number of flowers produced by fifty plants each of thirty-seven varieties ranged from 2,299 for Triumph to 4,758 for a strain of Express. The number for all varieties is shown graphically by the solid line in Fig 1. The broken line in this figure shows the yields from the plants on which the flowers were counted. Trice 270-41 yielded the most—20 pounds. This strain produced 4,383 flowers. It will be noticed that the two curves have the same general trend, indicating a positive correlation between number of flowers produced and yield.

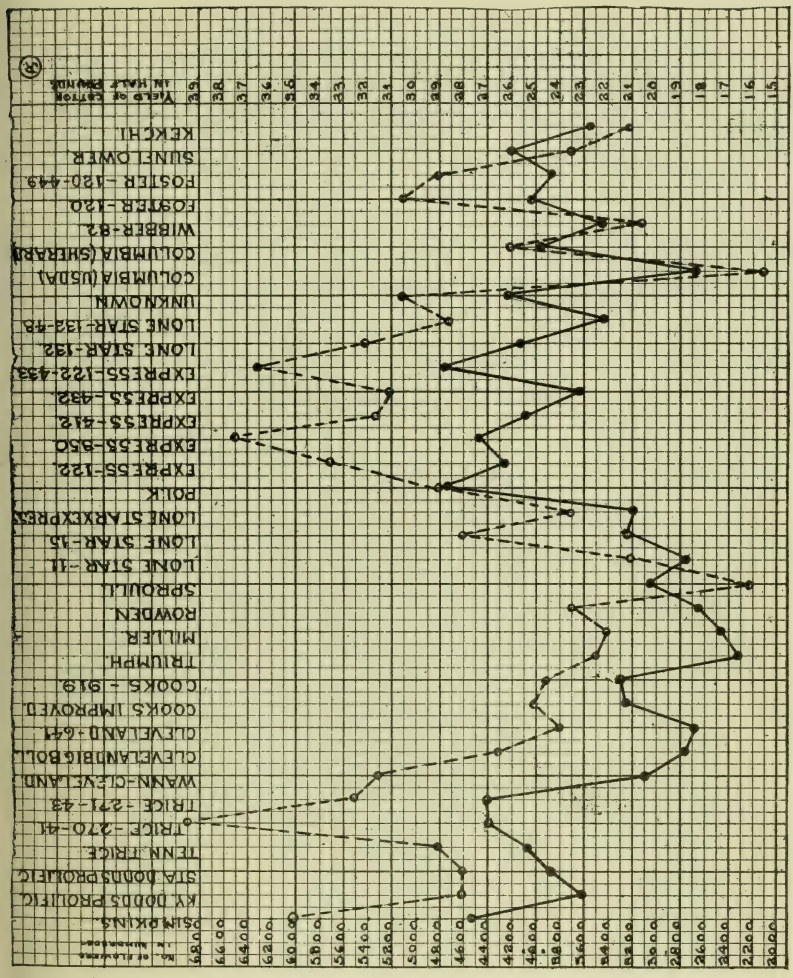

FIG. 1—Curves showing relation of flowering and yields. Flowers solid line and yields broken line.

RELATION OF SIZE OF BOLL TO NUMBER OF FLOWERS PRODUCED

The broken line in Fig. 2 shows the number of flowers produced by each variety listed, while the solid line shows the weight of a hundred bolls of each variety. It will be seen by following the trend of the curves that there is a negative correlation between these two characters. In general, if the size of the boll increases, the number of flowers produced decreases,—the curves tend to diverge.

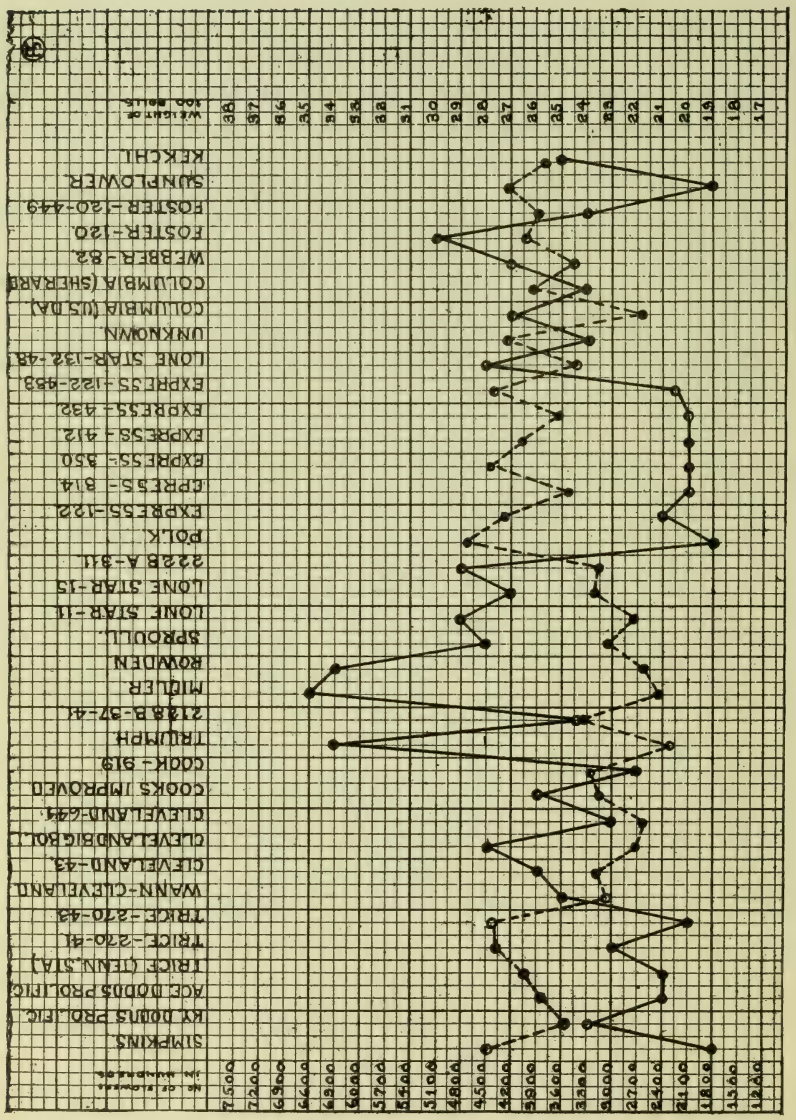

FIG. 2—Curves showing relation of number of flowers produced to size of bolls. Flowers

TABLE 15—NUMBER OF GINNERIES IN MISSISSIPPI IN 1916 AND QUANTITY OF COTTON, EXCLUSIVE OF LINTERS, GINNED FROM THE CROPS OF 1916 AND 1917.

COUNTY	Active Gins	Idle Gins	No. of Bales (Counting Round Bales as Half)		
			Total for 1916	1916 Prior to Dec. 13	1917 Prior to Dec. 13
Adams	9	12	1431	1355	2984
Alcorn	29	7	8891	8635	3610
Amite	23	10	4494	4463	9084
Attala	26	13	2677	2571	4229
Benton	32	6	6688	6329	2795
Bolivar	92	4	105393	100383	96354
Calhoun	23	9	1769	1717	1937
Carroll	26	4	4314	4290	6432
Chickasaw	15	8	4214	4195	5473
Choctaw	15	7	869	847	1014
Claiborne	10	17	3592	3580	6497
Clarke	10	12	877	809	1584
Clay	12	10	2391	2388	3935
Coahoma	82	9	104285	90497	55661
Copiah	22	9	3356	3343	5184
Covington	16	3	1324	1301	3204
DeSoto	34	2	32897	30552	12175
Forrest	3	4	318	309	.....
Franklin	12	10	2048	1983	3861
Grenada	19	6	3063	3046	4419
Hinds	30	....	11435	11381	20386
Holmes	48	24	14218	14115	25048
Issaquena	19	....	3246	3189	5321
Itawamba	29	5	1791	1759	1595
Jasper	20	6	1530	1503	3363
Jefferson	16	13	4411	4293	7021
Jefferson Davis	17	2	2803	2700	7007
Jones	10	5	1108	1058	.....
Kemper	35	21	1882	1810	3015
Lafayette	35	22	4330	4286	1749
Lamar	6	10	205	175	.....
Lauderdale	25	24	1626	1441	2596
Lawrence	15	3	4239	4226	7889
Leake	39	7	2415	2374	4458
Lee	19	8	6075	6016	7079
Leflore	73	8	40158	38825	41768
Lincoln	13	....	5203	5183	7340
Lowndes	27	19	2339	2273	6010
Madison	26	14	8977	8947	14786
Marion	16	1	1697	1650	2591
Marshall	45	13	20721	20079	9332
Monroe	23	16	4290	4264	6857
Montgomery	14	13	2188	2162	3257
Neshoba	26	14	2110	2009	3442
Newton	19	24	1838	1813	3418
Noxubee	30	9	5173	5137	11350
Oktibbeha	12	10	1591	1557	2565
Panola	46	10	23986	23861	14538
Perry	2	4	.....	.....	.....
Pike	25	1	4752	4731	8766
Pontotoc	19	6	3169	3157	3017

TABLE 15—NUMBER OF GINNERIES IN MISSISSIPPI IN 1916 AND QUANT[ITY] OF COTTON, EXCLUSIVE OF LINTERS, GINNED FROM THE CROPS OF 1916 AND 1917 (Continued)

COUNTY	Active Gins	Idle Gins	No. of Bales (Counting Round as Half Ba		
			Total for 1916	1916 Prior to Dec. 13	1917 Prior Dec. 13
Prentiss	22	5	8400	8224	3[illegible]
Quitman	28	.....	26362	25658	19[illegible]
Rankin	19	14	1971	1948	2[illegible]
Scott	18	9	1617	1602	2[illegible]
Sharkey	31	4	10396	10318	16[illegible]
Simpson	19	7	2565	2556	4[illegible]
Smith	23	12	1635	1623	3[illegible]
Sunflower	73	3	64995	62932	70[illegible]
Tallahatchie	54	7	39610	38783	30[illegible]
Tate	24	.....	19956	19745	10[illegible]
Tippah	18	4	9457	9182	3[illegible]
Tishomingo	20	.....	4918	4824	2[illegible]
Tunica	39	3	42941	37343	18[illegible]
Union	18	5	5760	5682	2[illegible]
Walthall	21	1	2932	2887	5[illegible]
Warren	17	18	4952	4630	6[illegible]
Washington	74	15	45266	43904	54[illegible]
Wayne	12	4	486	458	2[illegible]
Webster	19	11	1317	1280	2[illegible]
Wilkinson	13	17	1724	1584	4[illegible]
Winston	18	12	1157	1124	1[illegible]
Yalobusha	24	17	3128	3075	2[illegible]
Yazoo	52	14	14014	13647	29[illegible]
All Others	4	11	234	106	7[illegible]
Total for State	1949	667	800190	761682	7741[illegible]

DOES SELECTION PAY?

The Mississippi Experiment Stations carry on considerable selection work in connection with their work in cotton breeding. A number of new strains have been developed in this way, many of which stand well when compared with standard varieties. An effort is made to have in the variety tests each year fifteen or twenty of the most prominent varieties grown in the cotton belt. Along with these commercial varieties the best of our new strains are planted for comparison, and they usually make a very favorable showing. In 1917 our selections ranked as follows:

Delta Station, short staple test, 9 of the ranking 10 varieties.

Delta Station, long staple test, 7 of the 10 ranking varieties.

College Station, valley land test, 8 of the 10 ranking varieties.

College Station, hill land test, 3 of the 5 ranking varieties.

Holly Springs Station, valley land test, 9 of the 10 ranking varieties.

Strongs test, black prairie land, 3 of the 5 ranking varieties

Clarksdale test, buckshot land, 3 of the 5 ranking varieties.

Four of the new strains were planted in the test at Strongs, six at Clarksdale, and five in the hill land test at the College Station.

SOURCE OF SEED

Below is a list of the sources from which seed of the varieties tested was obtained:

Adair No. 1	T. P. Adair, Ruleville, Miss.
Allen's Long Staple	J. B. Allen, Port Gibson, Miss.
Baird	R. W. Baird, Inverness, Miss.
Black Rattler	J. S. Wise, Yazoo City, Miss.
Cleveland (Wannamaker)	Wannamaker and Son, St. Matthews, S. C.
Cleveland Big Boll	J. R. Cleveland, Decatur, Miss.
Cleveland-43	Mississippi Experiment Station
Cleveland-641	Alabama Experiment Station
Columbia X Express B-32	Mississippi Experiment Station
Columbia (U. S. D. A.)	Bureau Plant Industry, U. S. Dept. Agr.
Council-Toole	Georgia Board of Entomology, Atlanta, Ga.
Columbia (Sherard)	J. H. Sherard, Sherard, Miss.
Cook's Improved	J. R. Cook, Ellaville, Ga.
Cook-919	Alabama Experiment Station
Cook-307-6	Alabama Experiment Station
Dix-Afifi	Georgia Board of Entomology, Atlanta, Ga.
DeSoto	Georgia Board of Entomology, Atlanta, Ga.
Dix-Afifi	B. L. Cashburn, Sumner, Miss.
Dodds' Prolific (from Kentucky)	S. L. Dodds, Hickman, Ky.
Dodds' Prolific (from Station)	Mississippi Experiment Station
Dixie Improved	Georgia Board of Entomology, Atlanta Ga.

Dat So Improved	D. D. Low, Nitta Yuma, Miss.
Express-350	Mississippi Experiment Station
Express-314	Mississippi Experiment Station
Express-341	Mississippi Experiment Station
Express-122	Mississippi Experiment Station
Express-122-433	Mississippi Experiment Station
Express-412	Mississippi Experiment Station
Express-435	Mississippi Experiment Station
Express-32	Mississippi Experiment Station
Express (Low's)	D. D. Low, Nitta Yuma, Miss.
Foster-120	Mississippi Experiment Station
Foster-120-449	Mississippi Experiment Station
Foster-120-437	Mississippi Experiment Station
Foster-11	Mississippi Experiment Station
Kekchi	Bureau Plant Industry, U. S. Dept. Agr.
Kekchi	D. A. Saunders, Greenville, Texas
Lone Star-11	Mississippi Experiment Station
Lone Star-15	Mississippi Experiment Station
Lone Star-132-48	Mississippi Experiment Station
Lone Star X Express A-311	Mississippi Experiment Station
Lewis-63	Georgia Board of Entomology, Atlanta, Ga.
Magnolia	J. B. Allen, Port Gibson, Miss.
Miller	A. D. Miller, Blue Springs, Miss.
Osceola	Will Dockery, Ruleville, Miss.
Panther Burn	J. W. Johnson, Panther Burn, Miss.
Polk	Dr. Jas. Lacy, Lyons, Miss.
Rowden	Rowden Bros., Wills Point, Texas
Sunflower	Marx Schaefer, Yazoo City, Miss.
Scott	Alex Scott, Rosedale, Miss.
Sproull's Big Boll	Sproull and Hale, White Haven, Tenn.
Sea Island	Georgia Board of Entomology, Atlanta, Ga.
Trice (Tenn. Sta.)	West Tennessee Experiment Station
Trice-271-43	Mississippi Experiment Station
Trice-270-41	Mississippi Experiment Station
Tri-Cook	Alabama Experiment Station
Triumph	A. D. Mebane, Lockhart, Texas
Triumph X Express B-37-41	Mississippi Experiment Station
Unknown	J. B. Allen, Port Gibson, Miss.
Webber-82	Coker Seed Company, Hartsville, S. C.
Webber-49	Coker Seed Company, Hartsville, S. C.

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Bacteriological Effects of Green Manure

Study No. II.

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Bacteriological Effects of Green Manure

With the prevailing high prices of all crops raised on the farm it is very necessary to conserve the soil fertility. While stable manure is known to be one of the best and cheapest fertilizers obtainable, its supply is far below the demand. It is therefore necessary to search for the best methods of handling it and of supplementing it so as to extend its value to the greatest possible extent.

With this end in view a series of experiments on the bacteriological effects of green manures was started by the Mississippi Experiment Station in 1913, the special object of which has been to determine the effect of micro-organisms in the fermenting of green manures and particularly the advantage of a light dressing of stable manure as compared with that of a bacterial culture, in the utilization of these green manures for plant food.

The details of the plan and purpose of this work together with the results obtained the first year were published in Mississippi Experiment Station Bulletin 168.

Four years work have now been completed and the results of each of the four years are summarized in a separate table for comparison. See tables 2, 4, 6, and 8. Table 8 is taken from Bulletin 168 and shows the result of the first year's work. The study is made of all four years collectively for the sake of brevity and for comparisons.

PLAN OF THE WORK

In carrying out the experiments two series of jars are used, one for the bacteriological tests, and the other for the vegetative tests. Each series of tests is done in duplicate.

JARS. Three-gallon stone jars were selected with care, so that all practically have the same height and diameter. The ones cropped to oats are drained; the others used for bacteriological tests are not drained.

SOIL. The soil used was obtained from a tilled field on the Experiment Station farm. It is poor in plant food and is a mixture of a sandy silt and a sandy loam soil. The analysis shows it to contain only 648 pounds of total nitrogen to the acre for the plowed stratum of 6⅔ inches.

The soil was put through a one-fourth inch mesh sieve and thoroughly mixed before being placed in the jars. The water holding capacity was determined in each instance and sufficient water added to maintain the moisture of the jars at a constant of one-half the water holding capacity.

The soil used for the year 1914-1915 was obtained from the pots of the previous year, all being emptied on a large pile and intimately mixed. To this pile was added about one-sixth more of the original field soil that had been used the year before. This was again mixed thoroughly by shoveling over four times. The water holding power was found to be 26 per cent, and the pots were maintained at a moisture content of 13 per cent.

The soil for the year 1915-1916 was also obtained by using the soil from the pots of the previous year, 1914-15, all turned out on a large pile with 15 three-gallon pailfuls of the original field soil added. This was all made fine and thoroughly mixed by shoveling over three times. The purpose in using the same soil as used before was to determine the accumulative effect of the use of a green manure and to note its bacteriological effect. A discussion of these results is given on page 5.

The soil for the 1916-17 tests was another portion of the original field soil very much like that obtained in 1913-14. Its water holding capacity was 22 per cent and the pots were maintained at a moisture content of 11 per cent. In all cases the pots cropped to oats were watered to a good tilth.

Lime and Phosphate. The lime and phosphate used in each instance was similar to that used in 1913-14, described in bulletin 168, page 13. The proportions added are given in the several tables.

Green Manures. The green manures added have been respectively alfalfa, oats, alfalfa, and cow-peas. The amounts added are given in the tables for each year. The figures given represent the dry weights, though these manures were added green. The per cent of moisture was obtained and a sufficient amount of the green weight added to give the desired amount of dry matter. For instance, during the last year, 1916-17, to obtain 20 tons of the dry weight of cow-peas it was necessary to add 50 tons of the green peas or 2½ times the dry weight. See table 6.

Bacterial Emulsion. In each case the bacterial emulsion was made by growing a bacterial culture on standard agar plates. Large Petri dishes were used, and the agar was poured into the sterile dishes and solidified. They were afterward seeded with an emulsion of soil and stable manure. This emulsion was made quite rich and then allowed to settle a few hours so practically all the solid particles were removed. A small amount of the supernatant fluid was added to each dish and spread evenly over the surface. In this way the culture is grown entirely on the surface and is easily removed, being almost entirely free from any fertility.

After incubation at about 30 degrees Centigrade for one week the culture was gently rubbed from the surface and sterile tap water was used to make an emulsion of the cultures. The dilution was made to a certain opaqueness which contains approximately 250,000,000

germs to the cubic centimeter. One hundred cubic centimeters were added to each pot, that received the bacterial culture. Thus each pot getting the culture received an addition of about 25 billion germs.

DISCUSSION OF RESULTS

Number of Bacteria. The number of bacteria was determined by the same procedure as described in bulletin 168, page 14. Several different media have been tried. The synthetic media of Lipman & Brown gives equally as good results as any tried. Unless especially designated this was the media used. The dilutions and plating was done in the usual way. A study of the tables show that there is an intimate relation between the numbers of bacteria to the gram of dry soil and the fertility present. No special discussion of this point is necessary.

Vegetative Tests. The vegetative tests in each case gave more harmonious results than the bacterial tests. It is only in a few cases where the checks do not agree, but occasional disagreement is to be expected where such small fractions of an acre are used in experimental work. In each case oats were used in the vegetative test. The pots were planted with 15 to 20 grains of oats; and later thinned to ten stalks. The pots were watched carefully and watered to a good tilth. At first a uniform amount of water could be added to each pot; later as the oats were giving different amounts of growth, the evaporation from the several pots varied so the amount of water added was necessarily varied. For this reason, it was maintained as nearly as possible to the same moisture content as indicated by the tilth.

Limit to Amount Turned. It is a common notion that if a large amount of green manure is added it will be detrimental to the succeeding crop on account of the acidity produced. It was hoped that we might determine this limit. A study of the tables show that no such limit has been reached. In every case where an increased amount of the green manure was turned under a marked increase of the oat crop is noted, even where 50 tons of the green manure—green weight—were added as is shown in Table 6. The equivalent of 16 tons to the acre, 16 tons turned, in each of five instances produced an average of 71 grams for each pot of oats harvested, while the 20 tons turned, produced a crop of 82.5 grams or an increase of 16.2 per cent for the 25 per cent increase in the amount turned. See pots 21 and 22 in Fig. 3.

It appears that there is little danger from turning all the green manure that can be grown on the land at any one time. There is no doubt, however, that field conditions will differ some from the results secured with three-gallon stone jars. Yet we feel that our results are of much significance.

Effect of Lime. The beneficial effect of lime is marked as will readily be noticed from the exhibits in Tables 2, 4, 6, and 8.

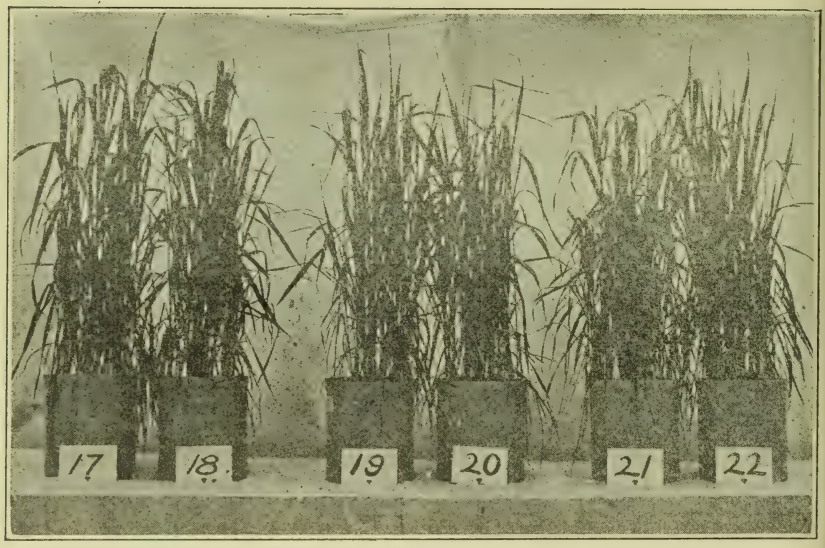
FIGS. 1 and 2—Showing oat crop of 1915-16 just before cutting. For results and treatment see Tables 3 and 4.

Where 8 tons of oats were turned with no lime, a crop of 48.85 grams was harvested, a gain of 5.7 grams for the lime treatment. See Table 2. Practically the same result obtains where the 16 tons were turned without and with lime added. It will be noted, however, that where more bacterial action was brought about by the addition of horse manure or a bacterial culture, there was a tendency to lessen the crop grown for the same amount of green manure turned. It will be seen in Table 2, that where 8 tons of green manure and three tons of lime were added, there were harvested 54.5 grams of oats; but where to this were added 4 tons of horse manure only 53.2 grams were harvested. Again, where 16 tons of green manure and three tons of lime were added a crop of 61.5 grams of oats was harvested; and where to this amount of green manure and lime turned under, there were added four tons of horse manure and a bacterial culture practically the same amount was harvested, 61.2 grams. Though we ought here to have expected an increase from the addition of the horse manure and bacterial culture. This fact is also shown in Tables 4 and 6. It is very probably due to a lack of lime to correct the acidity of the fermentations. These results, however, are not always harmonious, and much more work needs to be done to determine the exact relations and significance. It appears that the limit of the amount of green manure to be turned is being reached. As yet, however, as was noted above, the larger amount added always gives a marked increase of the crop produced.

Per Cent Nitrogen. The per cent of Nitrogen found in the oat crop is affected in a very marked degree in relation to the amount of the crop raised. While the per cent is not in direct proportion to the amount of crop raised, any marked increase in the crop shows a marked increase in the pounds of nitrogen for each ton of the crop grown.

A study of Tables 2, 4, 6, and 8 shows how intimate is this relation. Thus not only will a more fertile soil produce a larger crop, but will produce a crop with a much higher food value. It is therefore necessary to take into consideration when buying feed, whether it was raised on poor land or on fertile land. One cannot afford to pay as much a ton for oats grown on poor land as he does for oats grown on good land. This difference may amount to as much as 100 per cent; as shown by Tables 4 and 8.

The Accumulative Effect of a Green Manure. The accumulative effect of a green manure as might be expected is very marked. This can readily be seen by studying Tables 2, 4, 6, and 8. As was previously mentioned, the soil in the pots for 1914-15 was taken from the pots used the previous year, and the same repeated the following year. Thus the rotted manures of those years were accumulating and being intimately mixed with the soil. It will be seen that where nothing was added in each case, we have the first year a crop



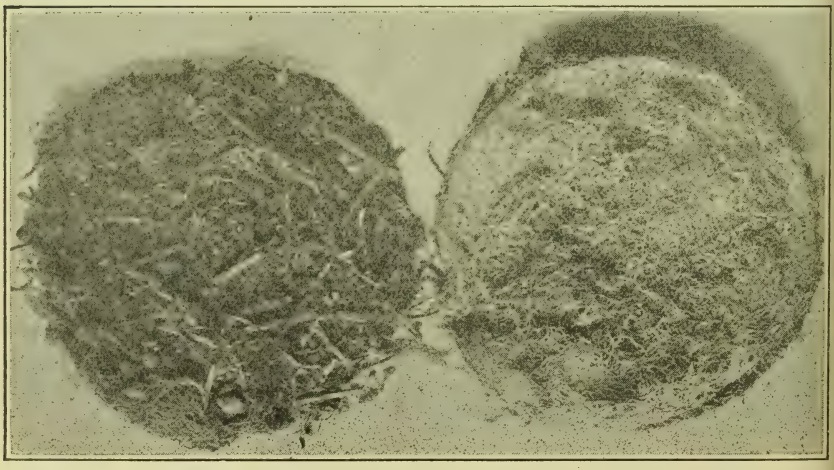


FIG. 3—(Above)—Showing a continuation of 1915-'16 oat crop.

FIG. 4—(Below)—Showing a mass of roots over the partly decayed oat and vetch straw.—See Table 7.

of 7.8 grams; the second year 41.25 grams, an increase of 427 per cent; the third year a crop of 77 grams, being 887 per cent more than the first year and 86 per cent more than the second year. This accumulative effect is evident throughout the treatment, as a comparison of Tables 4 and 2 shows. In any set of pots with the same treatment a marked increase is noted in Table 4 over that of Table 2. It will be noted also that the increase is very uniform, i. e. if the dry weights found in Table 2 are subtracted from those found in Table 4 where the same treatment is given almost a constant factor is found, varying slightly from the average of 39.1 grams increase. This increase being due to the accumulative effect of the addition of the green manure. See Table 9.

Oats and Vetch Straw. In 1916-17 a series of tests were made using the dry straw. The straw used was a mixture of oats and vetch. The proportions were about one part oats and two parts vetch. For comparison these tests were checked by turning three different amounts of horse manure, with, and without lime. Table 7 gives the scheme of treatment with the results. Note that the oat and vetch straw makes an excellent manure. Eight tons of the oats and vetch straw exceeds in value twenty tons of stable manure (horse manure) just as it was taken from the stable. The horse manure was practically free from bedding. It was fresh manure, taken a short time after voiding.

There is no doubt that the accumulative effect of the straw will far exceed that of the horse manure. Figure 4 shows the remains of the oats and vetch straw. The vetch straw in this remains, can yet be readily recognized, while with the manure that was turned, even where twenty tons an acre were used, only the slightest trace can be seen.

Where eight tons an acre of the oats and vetch straw were turned the average crop was 2.3 times that on the original sandy soil and where 16 tons were used the average was 3.2 times the crop from the untreated soil.

It is also seen that the number of pounds of nitrogen to the ton is correspondingly increased with the crop increase. This increases the food value approximately twenty per cent. These results emphasize the importance of turning under instead of burning, all straw, stubble, and crop residues.

It is noted also that where large amounts of the oats were used together with the horse manure or with a bacterial culture, or both, a depressing effect is brought about. The duplicates are close, indicating no error here. To just what this effect is due is not at present clear and more work will be necessary to determine it.

FIGS. 5 and 6—Showing oat crop of 1916-17 just before cutting. For results and treatment see Tables 5 and 6.

Conclusions

1. There is a direct relation between the bacterial count and the amount of organic matter added.

2. The vegetative test and the bacteriological test agree closely.

3. A light dressing of a stable manure or the addition of a bacterial culture with a green manure gives a marked increase in the crop when 4 tons of the green manure are added. When 8 tons are added the effect is practically neutral; when 16 tons are added a depressing effect is noted from the addition of the germs contained either in the manure or the bacterial culture. This is likely due to acids formed. More work will be necessary to determine this.

4. The nitrogen content of the oat crop varies directly with the amount of crop produced. The correspondence is markedly close; though not proportionately. The difference often amounts to 100 per cent.

5. The accumulative effect of a green manure is marked; showing a uniform addition through the various treatments, and the continued effect in the following years.

6. Where dry oat and vetch straw was turned amounts as large as 16 tons were readily utilized and produced a crop 3.2 times that from the untreated soil. Eight tons of the straw produced a larger crop than 20 tons of horse manure.

TABLE 1.

Bacterial Counts of Pot Cultures, 1914-1915

TREATMENT	Bacteria per gram				
	Dec. 19	Jan. 2	Jan. 16	Feb. 12	Ave.
Nothing added	11,800	10,350	11,950	9,850	10,716
T. O. & No Lime	16,500	13,450	13,650	12,750	13,283
6 T. O. & No Lime	13,300	15,400	13,350	14,450	14,400
T. O. & 3 T. L.	18,200	11,900	12,100	11,750	11,916
T. O. & 3 T. L.	22,700	13,150	14,500	16,000	14,550
6 T. O. & 3 T. L.	29,100	19,900	15,050	13,950	16,300
T. O. & 3 T. L. & 4 T. H. M.	27,400	15,850	14,950	15,500	15,450
6 T. O. & 3 T. L. & 4 T. H. M.	25,600	14,350	12,850	15,850	14,333
T. O. & 3 T. L. & Bact. Cul.	22,200	16,200	13,330	15,800	15,100
6 T. O. & 3 T. L. & 4 T. H. M. & Bact. Cul.	20,400	18,800	10,800	14,400	14,666

NOTE—To save space, in Tables 1, 3, and 5 the three last ciphers are omitted, only the millions and thousands are given.

FIGS. 7 and 8—Showing a continuation of oat crop, 1916-17.

TABLE 2

Weights, Tons per Acre, and Pounds per Ton of Oats from Pot Cultures Compared with Average Bacterial Counts, 1914-1915

TREATMENT	Oats				Average bacterial count
	Green wt. grams	Dry wt. grams	Tons per acre	lbs. nitrogen per ton	
Nothing added	162.7	41.25	4.27	16.2	10,716,000
8 T. O. No Lime	207.8	48.85	5.06	17.6	13,283,000
16 T. O. and No Lime	261.0	56.9	5.89	22.0	14,400,000
4 T. O. & 3 T. L.	165.5	48.5	4.00	15.7	11,916,000
8 T. O. & 3 T. L.	246.5	54.5	5.64	18.4	14,550,000
16 T. O. & 3 T. L.	284.5	61.5	6.37	23.32	16,300,000
8 T. O. & 3 T. L. & 4 T. H. M.	234.8	53.2	5.50	18.7	15,450,000
16 T. O. & 3 T. L. & 4 T. H. M.	320.2	61.2	6.33	23.1	14,333,000
8 T. O. & 3 T. L. & Bact. Cul.	280.5	53.5	5.54	19.5	15,100,000
16 T. O. & 3 T. L. & 4 T. H. M. & Bact. Cul.	284.2	65.6	6.59	21.8	14,666,000

TABLE 3

Bacterial Counts of Pot Cultures, 1915-1916

TREATMENT	Bacteria per gram of soil					
	Dec. 1 Synt. agar	Jan. 5 Synt. agar	Feb. 12 Nahr. agar	Feb. 23 Casein agar	Mar. 13 Casein agar	Average
Nothing added	1,280	1,120	10,200	12,550	5,150	6,060
8 T. Al. & No Lime	1,260	1,600	17,400	13,150	5,000	7,682
16 T. Al. & No Lime	1,500	1,360	13,900	15,850	4,750	7,472
4 T. Al. & 3 T. L.	1,280	1,220	16,000	15,800	4,900	7,820
8 T. Al. & 3 T. L.	1,200	1,160	17,300	16,050	4,950	8,132
16 T. Al. & 3 T. L.	1,140	1,160	18,600	17,250	5,300	8,690
8 T. Al. & 3 T. L. & 4 T. H. M.	1,960	1,060	16,400	15,850	6,700	8,494
8 T. Al. & 3 T. L. & Bact. Cul.	1,380	1,011	17,700	14,650	3,800	7,508
16 T. Al. & 3 T. L. & 4 T. H. M.	1,740	1,010	12,100	17,050	5,050	7,350
16 T. Al. & 3 T. L. & Bact. Cul.	1,000	,990	15,500	16,100	5,100	7,738
16 T. Al. & 3 T. L. & 4 T. H. M. & B. Cul.	1,480	1,320	13,550	21,000	7,900	9,050

TABLE 4.

Weights, Tons per Acre, and Pounds per Ton of Oats from Pot Cultures, Compared with Average Bacterial Counts, 1915-1916.

TREATMENT	Oats				Average bacterial count
	Green wt. grams	Dry wt. grams	Tons per acre	lbs. nitrogen per ton	
Nothing added	261.0	77.0	7.9	13.7	6,060,000
8 T. Al & No Lime	353.0	88.0	9.1	.....	7,682,000
16 T. Al. & No Lime	389.0	96.0	9.9	.....	7,472,000
4 T. Al. & 3 T. L.	342.0	88.5	9.2	.....	7,820,000
8 T. Al. & 3 T. L.	396.0	95.5	9.8	.....	8,132,000
16 T. Al. & 3 T. L.	448.5	99.0	10.2	.....	8,690,000
8 T. Al. & 3 T. L. 4 T. H. M.	386.5	93.0	9.6	.....	8,394,000
8 T. Al. & 3 T. L. & Bact. Cul.	380.0	97.5	10.1	.....	7,508,200
16 T. Al. & 3 T. L. & 4 T. H. M.	442.0	98.0	10.2	.....	7,250,000
16 T. Al. & 3 T. L. & Bact. Cul.	426.0	96.0	9.9	.....	7,738,000
16 T. Al. & 3 T. L. & 4 T. H. M. & B. Cul.	425.0	103.0	10.7	35.3	9,050,000

TABLE 5

Bacterial Counts of Pot Cultures, 1916-1917

TREATMENT	Casein Agar					Jan. 10 Gelatin
	Dec. 4	Dec. 19	Jan. 10	Feb. 10	Ave.	
Nothing added	5,500	7,150	5,800	5,600	6,012	1,200
8 T. C. P. & No Lime	14,300	24,100	27,800	13,000	19,800	4,200
8 T. C. P. & 3 T. L.	7,450	21,300	20,400	14,000	15,878	3,600
8 T. C. P. & 3 T. L. & 2 T. H. M.	6,200	35,900	20,400	10,800	18,325	2,400
8 T. C. P. & Bact. Cul.	11,700	33,150	37,700	14,600	24,287	3,600
16 T. C. P. & No Lime	6,900	19,100	25,600	17,000	17,150	2,450
16 T. C. P. & 3 T. L.	5,800	15,250	53,300	24,800	24,787	5,900
16 T. C. P. & 3 T. L. & 2 T. H. M.	55,200	14,300	33,600	16,200	17,325	4,500
16 T. C. P. & 3 T. L. & Bac. Cul.	8,700	11,450	32,400	15,800	17,089	3,850
16 T.C.P. & no Lime 2 T.H.M. & Bac. Cul.	8,675	27,650	40,900	19,200	24,128	5,200
20 T.C.P. & 3 T.L. & 2 T.H.M. & Bac. Cul.	7,350	19,150	64,100	18,600	27,300	6,675

TABLE 6

Weights, Tons per Acre, and Pounds per Ton of Oats from Pot Cultures, Compared with Average Bacterial Counts, 1916-1917.

TREATMENT	Oats				
	Green wt. grams	Dry wt. grams	Tons per acre	lbs. nitrogen per ton	Ave. bacterial count
Nothing added	61.5	16.5	1.65	11.8	6,012,500
8 T. C. P. & No Lime	242.5	53.8	5.57	13.35	19,800,000
8 T. C. P. & 3 T. L.	269.0	61.9	6.41	12.67	15,787,500
8 T. C. P. & 3 T. L. & 2 T. H. M.	287.0	65.15	6.75	13.60	18,325.000
8 T. C. P. & 3 T. L. & Bac. Cul.	291.5	59.3	6.14	15.50	24,287,500
16 T. C. P. & No Lime	369.0	73.2	7.50	17.40	17,150,000
16 T. C. P. & 3 T. L.	371.0	70.3	7.28	16.52	24,787,500
16 T. C. P. & 3 T. L. & 2 T. H. M.	355.5	71.8	7.45	16.20	17,325,000
16 T. C. P. & 3 T. L. & Bac. Cul.	341.5	70.7	7.32	18.05	17,085,500
16 T. C.P. & no Lime & 2 T.H.M. & Bac. Cul.	318.0	70.0	7.25	14.60	24,128,750
20 T. C.P. & 3 T. L. & 2 T. H.M. & Bac. Cul.	385.0	82.5	8.55	17.67	27,300.000

TABLE 7

Weights, Tons per Acre, and Pounds of Nitrogen per Ton of Oats from Pot Cultures, Showing the Effect of Bacterial Cultures, Stable Manure and Lime, 1916-1917

TREATMENT	Green weight grams	Dry weight grams	Tons per acre	Lbs. nitrogen per ton
No Manure & 3 T. L.	68.5	18.2	1.88	10.6
4 T. O. S. & 3 T. L.	117.0	29.3	3.03	10.6
8 T. O. S. & 3 T. L.	175.0	44.5	4.59	10.9
8 T. O. S. & 3 T. L. & 4 T. H. M.	173.0	42.3	4.37	11.6
8 T. O. S. & 3 T. L. & Bac. Cul.	175.5	43.8	4.52	11.5
16 T. O. S. & 3 T. L.	259.5	72.5	7.52	13.2
16 T. O. S. & 3 T. L. & 4 T. H. M.	270.5	60.1	6.22	14.35
16 T. O. S. & 3 T. L. & Bac. Cul.	267.5	62.4	6.46	12.1
16 T. O. S. & 3 T. L. & 4 T. H. M. & Bac. Cul.	249.5	54.4	5.63	12.3
16 T. O. S. No Lime & 4 T. H. M. & Bac. Cul.	232.5	55.0	5.80	12.3
4 T. H. M. & No Lime	77.5	23.4	2.42	8.9
10 T. H. M. & No Lime	106.5	27.9	2.89	9.9
20 T. H. M. & No Lime	150.5	40.5	4.19	11.6
4 T. H. M. & 3 T. L.	81.0	21.5	2.23	10.2
10 T. H. M. & 3 T. L.	111.5	29.1	3.01	10.6
20 T. H. M. & 3 T. L.	140.0	36.4	3.78	11.1

TABLE 8

Weights, Tons per Acre, and Pounds per Ton of Oats from Pot Cultures, Compared with Average Bacterial Counts, 1913-1914

TREATMENT	Oats				Ave. bacterial count
	Green wt. grams	Dry wt. grams	Tons per acre	lbs. nitrogen per ton	
Nothing added	29.85	7.8	.8	11.2	4,272,000
2 T. Al. & No Lime	127.65	32.7	3.3	16.8	5,345,000
2 T. Al. & 3 T. L.	135.55	32.7	3.3	16.4	5,734,000
4 T. Al. & 3 T. L.	161.00	36.5	3.7	25.0	5,718,000
4 T. Al. & 3 T. L. & 2 T. H. M.	186.15	38.2	3.9	26.8	7,155,000
4 T. Al. & 3 T. L. & 2 T. C. M.	174.85	37.3	3.8	24.4	6,827,000
4 T. Al. & 3 T. L. & 1 T. R. P. & 2 T. H. M.	194.50	42.0	4.3	23.2	7,176,000
4 T. Al. & 3 T. L. & Bac. Cul.	191.00	41.2	4.2	23.8	6,966,000
4 T. Al. & 3 T. L. & 1 T. R. P. & Bac. Cul.	186.10	40.9	4.2	23.8	6,871,000
4 T. Al. & 3 T. L. & 1 T. R. P. & 2 T. H. M. & Bac. Cul.	171.90	38.5	4.0	23.0	6,524,000

TABLE 9

Showing the Accumulative Effect of Adding a Green Manure and the Constant Increment Through Various Treatments.

TREATMENT	Table 4. 1915-16 dry wt.	Table 2. 1914-15 dry wt.	Difference
Nothing added	77.0	41.25	35.75
8 T. & No Lime	88.0	48.85	39.15
16 T. & No Lime	96.0	56.90	39.90
4 T. & 3 T. L.	88.5	48.5	39.15
8 T. & 3 T. L.	95.5	54.5	41.0
16 T. & 3 T. L.	99.0	61.5	37.5
8 T. & 3 T. L. & 4 T. H. M.	93.0	53.2	39.8
8 T. & 3 T. L. & Bac. Cul.	97.5	53.5	44.0
16 T. & 3 T. L. & 4 T. H. M.	98.0	61.2	36.8
16 T. & 3 T. L. & Bac Cul.	96.0	*	.....
16 T. & 3 T. L. & 4 T. H. M. & Bac. Cul.	103.0	65.6	38.4
Average difference	.....	.....	39.09

*No corresponding treatment.

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BULLETIN No. 186 - MARCH, 1919

COTTON EXPERIMENTS 1918

By H. B. BROWN, Ph. D.

COTTON VARIETY TEST, COLLEGE STATION, 1918
A STUDY IN CLOSE SPACING

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

J. R. RICKS, Director

SUMMARY AND RECOMMENDATIONS.

The Weather—Dry weather during May, June, and July retarded the growth of cotton plants and consequently they were much smaller at maturity than they normally are.

Boll Weevil Damage—Taking the State as a whole, we find weevil damage less in 1918 than in any year since weevil infestation became widespread over the State. The light weevil damage was due principally to the dry weather.

The 1918 Results Not Normal—Some excellent varieties for growing in weevil-infested territory made a poor showing in 1918 because of the dry weather and the scarcity of weevils.

Good Varieties—For thin hill land, Wannamaker-Cleveland, Cleveland Big Boll, and Miller; for rich hill land that is not infected with wilt, Trice; for Delta and valley land, free from wilt, if weevil infestation is heavy, Express, Trice, Foster, and Wannamaker-Cleveland; for valley land with light wilt infection, and light weevil infestation, Miller, Wannamaker-Cleveland, Polk, and Columbia; for heavy wilt infection and no or few weevils, Lewis 63 and Tri-Cook; for heavy wilt infection, and heavy weevil infestation plant some crop other than cotton.

Varieties with Staple under 7-8 inch—The planting of varieties with extremely short staple is not advised. There may be no market for such cotton.

Use Good Seed—Pure seed of good varieties usually give much better returns than mixed seed.

Use Home Grown Seed—Seed grown in Mississippi will probably produce better yielding plants than seed grown in any other State.

Use One Variety in a Community—It would pay planters to grow but one variety in a community. This uniformity would lessen or prevent mixing in fields and at the gin, and would facilitate marketing.

Single Stalk Culture—Results obtained in 1918 again indicated that it was the close spacing rather than the delayed thinning that was responsible for gains when this method of cotton culture was practiced.

COTTON EXPERIMENTS, 1918

By H. B. Brown, Ph.D.

INTRODUCTION.

This report covers a field similar to that covered by other annual cotton bulletins published by the Experiment Station during the past several years. There is more or less repetition from year to year, but we are inclined to think that even repetition is of value because, with the numerous, varying, and uncontrollable conditions under which field crops are grown, many trials are necessary to establish facts. There is some changing of varieties from year to year to include new and promising strains that appear, but in the main the same varieties are retained for several years. The cotton growers of the state are always anxious for an immediate report on the performance of varieties under the conditions that obtained during any particular year.

Variety studies were made at all four of the Experiment Stations and also on the plantation belonging to Mullens and Lacy, near Clarksdale. Dr. W. J. Lacy planted and cultivated the experimental cottons on this plantation.

Weather tables are given in connection with the different tests and other environmental conditions are outlined in some detail. These data may help the reader in deciding what varieties are best adapted to his own local conditions.

In addition to the variety work, there are included results from certain other experiments that may be of general interest to the cotton growers.

The numbers used along with the names of certain varieties are to designate selected strains of the parent varieties. Cook-1010 was selected by the Alabama Experiment Station; College No. 1, by Professor Rast, of the University of Georgia; and Webber-49, by the Coker Seed Co., of Hartsville, S. C. The other numbered selections were selected by the Mississippi Experiment Station. Seed of the most promising strains will be distributed as soon as available in quantity.

The Weather.*

Over the state as a whole, the weather during the season of 1918 was unusually dry. From March to September, inclusive, every month except April had less than the normal rainfall, the total deficiency for those months being 11.32 inches. This dry weather held in check the vegetative growth of cotton plants but a good crop was made nevertheless, largely because of the fact that the dry weather prevented the rapid multiplication of boll weevils.

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*This discussion is based on reports issued by the Vicksburg Weather Bureau, reports issued by J. A. Ramey, Field Agent for the Bureau of Crop Estimates, and on personal observations.

Beginning with March, the weather was unusually warm and the rainfall light, there being less than one inch on the average. These conditions were favorable for farm work and tempted many to plant cotton exceptionally early. April was relatively cool and wet. Killing frosts occurred over a large part of the interior of the State on the 12th, injuring considerable cotton that was up. Continued cold, wet weather injured stands and made re-planting necessary in many cases. The continued dry weather during June, July and August caused much shedding, premature top blooming, premature boll opening, and made conditions favorable for the red spider to do damage. The weather during September was cooler than usual and precipitation deficient. This condition was favorable for picking and most of the crop in the hill section of the State was gathered by the first of October. October weather was very unusual. It broke the records for both warmth and rainfall for this month. The temperature was 4.5 above normal and precipitation 7.24 inches above. This continued warm, rainy weather prevented picking, caused much boll rot and sprouting of seeds, and lowered the grade of all unpicked cotton.

Killing frosts did not occur over much of the State until in November. This delay gave the late crop a good chance to develop, but it also favored the boll weevils and many went into hibernation late in the season. This fact will improve their chances for doing damage next year.

Boll Weevils.

Boll weevils appeared unusually early in many parts of the State during the season of 1918 and apparently many came out of hibernation. This early appearance was surprising since it had been generally predicted that the cold weather during the previous winter, a zero temperature or below in many parts of the State, would kill most of the hibernating weevils. Although they appeared early, they either failed to hold their own, or failed to multiply rapidly because of the dry weather. In some localities there was considerable weevil damage but for the State as a whole there was less damage than any year since weevil infestation became widespread over the state.

Classing.

Classing was done by McGee, Dean & Co., Leland, Miss., by the New Orleans Cotton Exchange, and by the John M. Parker Co., New Orleans, La. The Experiment Station is greatly indebted to each of these firms for this service.

The length of the staple given for several of the varieties is less than given the two previous years. This condition was due in part, probably, to the varying ideas of different classers, and possibly, in part to the dry weather. The local classers were of the opinion that the continued dry weather kept the staple from attaining its usual length.

RESULTS FROM THE COLLEGE STATION.

Local Weather Conditions.

The following table, compiled from reports made by Dr. Chas. F. Briscoe, local weather observer, gives data on important meteorological factors having a bearing on cotton production in the east-central part of the State.

Table 1—TEMPERATURE AND RAINFALL, 1918

MONTH	Mean Temperature.	Departure from the normal temperature.	Highest temperature.	Average maximum temperature.	Lowest temperature.	Average minimum temperature.	Total precipitation in inches.	Departure from the normal in precipitation.	No. of days on which precipitation occurred.
January	35.4	—9.9	71.	46.3	—1	24.4	7.73	+2.73	10
February ..	51.3	+4.8	84.	63.2	24	39.4	3.03	—2.10	4
March	62.1	+6.3	89.	75.3	32	48.9	1.17	—5.5	4
April	61.2	—2.5	86.	72.4	31	51.3	8.13	+3.70	7
May	73.	+1.3	94.	84.9	44	61.1	1.97	—2.31	1
June	81.8	+3.2	102.	92.9	60	70.8	4.74	+ .30	8
July	80.	—1.1	99.	90.9	60	69.2	2.95	—2.09	7
August	82.6	+2.2	102.	94.8	61	70.4	1.16	—2.79	5
September	71.4	—4.2	95.	85.	42	57.7	3.97	+1.33	6
October	67.8	+2.9	91.	78.9	42	56.6	10.76	+8.69	11
Total rainfall for ten months.....							45.61	+6.91	

From the table given above it will be seen that the mean temperature from March to October was above the normal for five months and below for three. The total precipitation for the ten months, 54.61 inches, was 6.91 inches above normal. This excess was due largely to the unusually heavy precipitation in October. For the seven months beginning with March and ending with September, the months most important to the growth of cotton, the rainfall was 7.36 inches below normal.

Variety Studies at College Station, 1918—On Valley Land.

The varieties in this test were planted April 15 and 16 on moderately fertile loam land that had been in cotton four years. No fertilizer was used except a light coating of barn yard manure. A Gale-Hooper one-horse planter was used in planting and was run over each row twice, set to plant shallow on one through, and deep on the other. By planting, in this way, considerable seed at different depths, one may be somewhat independent of weather conditions. If dry weather prevails the more deeply planted seeds will germinate, while if the weather is cold and rainy the shallow planting will produce a stand. As a result of this method of planting, an almost perfect stand was secured. The usual methods of culture recommended by the Experiment Station were followed.

This cotton was chopped out May 20; the first squares were observed May 27, forty-two days after planting; and the first blossoms June 16, which was sixty-two days after planting.

Boll weevils were found in the variety plats June 14, and two days earlier in some other plats on the College farm. This date was earlier than usual for their first appearance and they seemed to be in comparatively large numbers for the initial infestation. They multiplied very slowly. In the most badly infested plat on the College farm there was only a 5 per cent infestation on July 20. After this time, they multiplied more rapidly, becoming numerous enough to stop the blooming in most of the plats between August 7 and 10. By this time the crop was so nearly made that but little damage was done, especially to the first crop. The top crop was destroyed.

Wilt or blight attacked all the varieties in the test more or less and damaged certain of the more susceptible varieties considerably. The ones damaged most were Trice, Lone Star, Kekchi, and Foster. The most resistant were Mexican Big Boll, Miller, Polk, Columbia, and Sunflower. Table 5 gives the percentage of infection of the different varieties.

The yields (see Table 2) were better than the average since boll weevils came. Dry weather during June and July seemed to injure the extremely early varieties, like Simpkins, Trice, and Express, more than it did the more vigorous big boll varieties; and in addition the longer period of time in which to make a crop favored the medium early and later varieties. Consequently we find them ranking higher in comparative yields than is usual under weevil infestation.

Table 2—VARIETY STUDIES ON VALLEY LAND, COLLEGE STATION, 1918

VARIETY	Pounds of seed cotton per plat.	Pounds of seed cotton per acre.	Per cent lint.	Pounds of lint per acre.	Length of staple in inches.	Character of staple.	Value of lint per pound in cents.	Value of lint.	Value of seed at $68.00 a ton.	Total money value.	Rank in money value.	Weight of 100 bolls in ounces.
Dodds' Prolific	97.40	1519	32.7	497	1	Good	31.5	156.55	34.75	191.30	11	21.5
Trice (Tenn. Sta.)	77.75	1213	31.9	387	1	Fair	31.0	111.97	28.08	144.57	31	22.
Trice (Ark. Sta.)	94.45	1473	30.8	454	1	Poor	30.5	138.47	34.65	173.12	25	23.5
Trice—270-41	94.55	1475	30.6	451	1 1/16	Fair	32.25	145.45	34.82	180.27	22	21.
Wannamaker-Cleveland	101.20	1579	37.3	589	7/8	Fair	30.75	181.12	33.66	214.78	5	25.
Cleveland—43	104.30	1627	34.4	560	1 1/16	Poor	31.75	177.80	36.28	214.08	6	25.
Cleveland Big Boll	105.75	1650	36.7	606	7/8	Good	31.25	189.37	35.50	224.87	4	28.
Cook—1010	83.15	1297	41.5	538	3/4	Fair	29.75	160.05	25.81	185.86	20	24.
College No. 1	100.20	1563	34.2	535	7/8	Fair	30.75	164.51	34.95	199.46	9	25.
Sunbeam	94.20	1470	34.2	503	7/8	Good	31.25	157.19	32.88	190.07	15	23.
Mexican Big Boll	119.15	1859	33.9	630	7/8	Fair	30.75	193.72	41.79	235.51	2	25.5
Triumph	85.55	1335	37.5	501	1 1/16	Good	32.75	164.08	28.36	192.44	10	33.
Miller	116.35	1815	34.1	619	1 1/16	Poor	31.75	196.53	40.66	237.19	1	32.5
Lone Star—15	102.75	1603	36.9	592	1 1/16	Fair	32.25	190.92	34.37	225.29	3	27.
Polk	98.25	1533	30.1	461	1 3/16	Good	35.75	164.81	36.45	201.26	8	19.
Express—350	94.75	1478	29.3	433	1 3/16	Fair	35.25	152.63	35.53	188.16	17	21.
Express—122-433	98.70	1540	28.1	433	1 3/16	Fair	35.25	152.63	37.64	190.27	14	22.
Express—122-457	99.25	1548	27.9	432	1 1/8 full	Good	34.25	147.96	37.94	185.90	18	20.
Express—432	103.50	1615	32.7	528	1 1/8 full	Poor	33.25	175.56	36.96	212.52	7	20.
Express—122-475	103.75	1619	29.1	471	1 1/16	Fair	32.25	151.90	39.03	190.93	12	20.
Lone Star—132-48	87.75	1369	31.4	430	1 1/8	Poor	32.25	138.67	31.93	170.60	27	27.
Lone Star—132	92.25	1439	28.3	407	1 1/8	Fair	32.75	133.29	35.09	168.38	29	21.
Magnolia	92.25	1439	27.4	394	1 1/8	Extra Good	33.75	132.97	35.53	168.50	28	20.5
Columbia	97.50	1521	29.1	443	1 3/16	Poor	34.75	153.94	36.65	190.59	13	23.
Express—Simpkins	85.25	1330	32.2	428	1 1/8	Fair	32.75	140.17	30.67	170.84	26	21.
Kekchi	64.50	1006	31.8	320	1 1/8	Poor	32.25	103.20	23.32	126.52	32	22.
Webber—49	89.75	1400	30.3	424	1 3/16	Good	35.75	151.58	33.18	184.76	21	22.
Foster—120-4101	83.25	1299	31.6	410	1 3/16	Fair	35.25	144.52	30.23	174.75	24	24.5
Foster—120-482..	90.75	1416	29.2	413	1 3/16 full	Poor	36.75	151.78	34.10	185.88	19	23.
Foster—120	76.25	1190	31.5	375	1 3/16	Fair	35.25	132.19	27.71	159.90	30	25.
Foster—11	87.00	1357	30.8	418	1 3/16 full	Good	37.75	157.79	31.93	189.72	16	23.
Sunflower	85.00	1326	29.0	385	1 1/4	Poor	38.25	147.26	31.99	179.25	23	19.

Table 3—VARIETY STUDIES ON HILL LAND COLLEGE STATION, 1918

VARIETY	Pounds of seed cotton per plat.	Pounds of seed cotton per acre.	Per cent lint.	Pounds of lint per acre.	Length of lint in inches.	Character of staple.	Value of lint per pound in cents.	Value of seed at $68.00 a ton.	Value of lint.	Total money value.	Rank in money value.
Dodds' Prolific	27.5	569	32.7	186	1	good	31.50	13.02	58.59	71.61	9
Trice—270-41	26.5	549	30.6	168	1 1/16	fair	32.25	12.95	54.18	67.13	10
Wannamaker-Cleveland	36.	745	37.3	278	7/8	fair	30.75	15.88	85.48	101.36	4
Cleveland Big Boll	39.5	818	36.7	300	7/8	good	31.25	17.61	93.75	111.36	2
Cook—1010	28.5	590	41.5	245	3/4	fair	29.75	11.73	72.89	84.62	7
College No. 1	39.	807	34.2	276	7/8	fair	30.75	18.05	84.87	102.92	3
Triumph	33.5	693	37.5	260	1 1/16	good	32.75	14.72	85.15	99.87	5
Miller	44.5	921	34.1	314	1 1/16	poor	31.75	20.64	99.69	120.33	1
Lone Star—15	29.5	611	36.9	225	1 1/16	fair	32.25	13.12	72.56	85.68	6
Express—432	28.	580	32.7	190	1 1/8 full	poor	33.25	13.26	63.17	76.43	8
Lone Star—132	20.5	424	28.3	120	1 1/8	fair	32.75	10.34	39.30	49.64	13
Webber—49	22.	455	30.3	138	1 3/16	good	35.75	10.78	49.33	60.11	11
Kekchi	21.5	445	31.8	142	1 1/8	poor	32.25	10.30	45.79	56.09	12

Variety Studies on Hill Land.

Table 3 shows the main results from the variety studies on hill land in 1918. The land used in this test was thin hill land that had been in cotton for three years. No fertilizer was used. While the yields are naturally low, the test shows well the relative merits of the different varieties when grown on such a type of soil with scanty rainfall. The big boll varieties stand out conspicuously with Miller in the lead.

Study of Wilt Resistance.

On a good many plantations certain varieties of cotton do not do as well as other varieties because the soil is diseased or infested with an organism causing cotton wilt. On account of this fact, the study of wilt resistance becomes a matter of considerable importance to cotton growers.

The list of varieties shown in Table 4 includes most of the prominent wilt resistant grown in this country. The list contains, in addition, three non-resistant varieties, Express-412, Trice, and Wannamaker-Cleveland. The first two are very susceptible, while Wannamaker-Cleveland is intermediate in this respect. Some strains of Express are much more resistant than Express-412. Express X Covington-Toole is a hybrid between Express and Covington-Toole. 37W-54 is a selection from Wannamaker-Cleveland, selected for wilt resistance.

The soil on which this test was conducted was sandy loam of rather low fertility and badly infected with the cotton wilt organism. The dry weather prevailing during a considerable part of the season served to hold the disease in check to some extent, but a careful examination showed a rather high percentage of infection even in the case of the wilt resistant varieties. (See Table 4.) Very few of the plants belonging to the wilt resistant varieties gave any external evidence of being diseased and their yield was affected very little, if any; but an examination of the interior of the stem showed the wilt organism. The susceptible varieties gave marked external evidence of the disease and their yield was lowered materially. A number of their plants died before producing a crop of bolls.

The yields from the wilt resistant varieties in this test are mostly good considering the fertility of the soil. On account of the light weevil infestation during June and July the fruiting season was lengthened considerably. This increase gave the moderately late resistant varieties time to set a good crop of fruit.

Table 4—STUDY OF WILT RESISTANCE, COLLEGE STATION, 1918

VARIETY	Pounds of seed cotton per plat.	Pounds of seed cotton per acre.	Per cent lint.	Pounds of lint per acre.	Length of staple in inches.	Value of lint per pound, in cents.	Value of lint.	Value of seed at $68.00 a ton.	Total money value.	Rank in money value.	% plants infected wilt.
Wannamaker-Cleveland	41.25	1283	37	475	7/8	31.25	148.44	27.47	175.91	4	82
Council-Toole	41.25	1283	33	423	7/8	31.25	132.19	29.24	161.43	8	79
Cook—307-6	38.	1182	35	414	3/4	30.25	125.23	26.11	151.34	9	74
Trice (Ark.)	28.	871	31	270	1	31.50	85.05	20.43	105.48	11	91
Dixie Improved	42.75	1330	32	426	1	31.50	134.19	30.74	164.93	7	80
Express—412	25.75	801	29	232	1 1/8	33.25	77.14	19.35	96.49	12	96
Dix-Afifi	38.75	1205	27	325	1 3/16	35.75	116.19	29.92	146.11	10	75
Lewis—63	45.	1400	32	448	1	31.50	141.12	32.37	173.49	6	71
Tri-Cooke	44.5	1384	37	512	7/8	31.25	160.00	29.65	189.65	1	68
Express—Covington-Toole	46.25	1438	31	446	1	31.50	140.49	33.73	174.22	5	79
Covington-Toole	45.	1400	35	490	7/8	31.25	153.12	30.94	184.06	3	75
37W—54	45.	1400	36	504	7/8	31.25	157.50	30.46	187.96	2	82

Table 5—WILT INFECTION IN REGULAR VARIETY TEST, COLLEGE STATION, 1918

VARIETY	Per cent uninfected plants.	Per cent plants infected but damaged slightly, if any.	Per cent plants infected and damaged considerably.	Per cent plants killed by wilt, and producing no cotton, or but little.
Dodds Prolific	42	41	13	4
Trice (Tenn. Sta.)	22	49	26	3
Trice (Ark. Sta.)	35	49	8	8
Trice—270-41	24	55	15	6
Wannamaker-Cleveland	39	48	10	3
Cleveland—43	37	53	9	1
Cleveland Big Boll	38	51	9	2
Cook—1010	41	41	13	5
College No. 1	40	49	9	1
Sunbeam	29	56	14	1
Mexican Big Boll	50	46	4	0
Triumph	43	41	13	3
Miller	58	37	4	1
Lone-Star—15	45	45	4	6
Polk	57	41	2	0
Express—350	31	62	4	3
Express—432	32	67	1	0
Express—122-433	48	48	3	1
Express—122-457	24	69	6	1
Express—122-475	40	55	4	1
Lone Star—132-48	19	72	7	2
Lone Star—132	16	63	18	3
Magnolia	24	70	4	2
Columbia	46	49	2	3
Express—Simpkins	16	63	15	6
Kekchi	13	54	21	12
Webber—49	29	56	12	3
Foster—120-4101	20	66	12	2
Foster—120-482	21	60	13	6
Foster—120	17	52	18	13
Foster—11	19	52	17	12
Sunflower	49	45	1	5

Table 5 shows the percentage of wilt infection of the varieties in the regular variety test. No wilt resistant varieties were included in this test because we do not recommend them for general planting in this State. All that we have tried have been too late to be satisfactory in regions of heavy weevil infestation.

As will be seen from Table 5 the plants of each variety were divided into four classes on basis of wilt infection. The amount of infection was determined by cutting into the stem of a hundred plants of each variety. External attributes were also considered. Any variety that has many of its plants falling in classes three and four will not be satisfactory for planting where there is any wilt in the soil.

Experiments with Single Stalk Cotton Culture.

During the past three years the Experiment Station has carried on experiments with what has been termed "A new method of cotton culture," by the Office of Cotton Breeding and Acclimatization, U. S. Department of Agriculture. The essential feature of this system of culture is the suppression of vegetative branches by delayed or late thinning. (This system of culture is explained in some detail in Bulletin No. 178, Mississippi Experiment Station, and also in different papers issued by the Bureau of Plant Industry, U. S. D. A.)

In 1916 the early thinned rows were thinned to 8 to 12 inches in the drill, while the other rows were thinned to 6 inches. Trice cotton was used, and the stand was only fair; wilt injured some plants, and boll weevils made the fruiting season very short. The late thinned rows out-yielded the early thinned by .36 pounds per row.

In 1917 both sets of plats were thinned to six inches in the drill. Express cotton was used and an excellent stand secured. The early thinned rows out-yielded the others by about 8.6 per cent.

Wannamaker-Cleveland cotton was used in 1918. It was planted April 26 and an excellent stand secured. Both series of plats were thinned to a "hoe's width," or approximately ten inches in the drill. The early thinning was done May 16. The plants were then small—the first true leaves had just appeared. The late thinning was done June 10. The plants were then about ten inches tall and the crowding effect had made them somewhat taller than the plants in the other rows.

Table 6—SINGLE STALK COTTON CULTURE RESULTS 1918

Row		Pounds of seed cotton per row.	Number of plants per row.	Number of vegetative branches per row.
1	Regular Thinning	12.5		
2	Regular Thinning	10.5	102	258
3	Regular Thinning	12.5	112	252
4	Regular Thinning	12.5	118	248
5	Regular Thinning	9.5		
6	Delayed Thinning	9.5		
7	Delayed Thinning	10.	107	192
8	Delayed Thinning	10.	118	212
9	Delayed Thinning	11.	122	224
10	Delayed Thinning	12.		
11	Regular Thinning	12.		
12	Regular Thinning	13.	114	260
13	Regular Thinning	10.	112	276
14	Regular Thinning	10.5	106	243
15	Regular Thinning	10.5		
16	Delayed Thinning	10.5		
17	Delayed Thinning	8.5	98	192
18	Delayed Thinning	8.	98	202
19	Delayed Thinning	10.5	104	194
20	Delayed Thinning	10.		
21	Regular Thinning			
22	Regular Thinning	12.	102	265
23	Regular Thinning	11.	102	264
24	Regular Thinning	11.	90	232
25	Regular Thinning	10.		
26	Delayed Thinning	10.5		
27	Delayed Thinning	10.	98	197
28	Delayed Thinning	7.5	94	182
29	Delayed Thinning	7.5	100	189
30	Delayed Thinning	8.5		
31	Regular Thinning	9.5		
32	Regular Thinning	8.5	98	
33	Regular Thinning	8.5	102	
34	Regular Thinning	6.5		
35	Delayed Thinning	6.5		
36	Delayed Thinning	6.	103	
37	Delayed Thinning	5.	97	
38	Delayed Thinning	6.		
Average Regular Thinning		10.9	105.3	255.3
Average Delayed Thinning		8.5	103.6	198.2

Table 6 gives certain data on the experiment in 1918. The whole plat contained 38 rows; these were grouped in 8 sub-plats containing 4 or 5 rows each. The weights of only the three middle rows of the five-row plats, and two middle rows of the four-row plats were used in comparisons. The weights from these rows averaged 10.9 pounds for the early thinned and 8.5 pounds for the late thinned. The number of plants in the two sets of rows averaged practically the same—105.3 in one case and 103.6 in the other. The early thinned rows were more spreading and looked more

stocky and vigorous during most of the season. A count of the vegetative branches showed that they had an average of 255.3 to the row while the others had 198.2. There was considerable difference, too, in the height of the origin of the lowest vegetative branch. The average distance from the ground to the first branch for the early thinned rows was 4.8 inches and 7.6 inches for the others.

On July 1, just a few days after blooming began, 63 blossoms were counted on the early thinned rows and only 24 on the others. This seemed to indicate that the early thinned rows were fruiting a little earlier. Cardon,* in a recent paper reporting the results of 21 experiments, conducted in Louisiana, Arkansas, and North Carolina in 1915, reported a gain in yield from the new system of culture in 18 of the 21 experiments, and endorsed the new system rather highly. However, in no instance, in so far as we are aware, did he show that the increased gain was due to late thinning rather than to the close spacing. The late thinned rows in all his experiments were given closer spacing. Considering the fact that neither Cardon nor other U. S. Department of Agriculture workers who have published papers on this subject, tested the value of close spacing, and since our results have shown in carefully conducted tests, where there were excellent stands, that the factor of close spacing is responsible for the gain in yields, we are inclined to doubt the value of delayed thinning.

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*Experiments with single-stalk cotton culture in Louisiana Arkansas, and North Carolina. By P. V. Cardon, U. S. Department of Agriculture, Bulletin 526, (1918, pp. 31.)

RESULTS FROM THE HOLLY SPRINGS BRANCH STATION

By C. T. Ames.

Variety Test, 1918.

Table 8 gives the main results of the test. This cotton was planted April 26 in 1-16-acre plats on fertile, well-drained, brown loam valley land which had been fertilized with 300 pounds of acid phosphate and 100 pounds of cotton seed meal per acre two weeks before planting. It was necessary to do some replanting by hand to have a good stand. Prolonged dry weather retarded the growth of all varieties. None attained a height of more than three feet, or made normal yield. Cotton wilt damaged Trice and Simpkins slightly. No boll weevils appeared in the plats although some were seen in the county.

Cook-1010, Wannamaker-Cleveland, and Express-432 stand out conspicously in yields and are excellent varieties for this type of soil. Short cottons like Cook rank better than usual this year on account of the low premium paid for longer staple. It frequently happens that there is no sale for such short cottons and a grower is taking a risk if he plants them. For hill land, Wannamaker-Cleveland, Miller, and Cleveland Big Boll are recommended.

Table 7—TEMPERATURE AND RAINFALL, HOLLY SPRINGS, 1918

MONTH	Mean Temperature.	Departure from the normal temperature.	Highest temperature.	Average maximum temperature.	Lowest temperature.	Average minimum temperature.	Total precipitation in inches.	Departure from the normal in precipitation.	No. days precipitation occurred.
January	27.1	—13.9	61	37.1	—9	17.1	5.26	+ .59	8
February	45.	+4.	81	57.1	19	33.	2.76	—1.74	4
March	58.	+6.7	84	70.5	30	45.5	.46	—6.18	3
April	58.	—3.2	87	68.6	31	47.5	7.25	+2.11	9
May	72.5	+2.8	93	84.2	40	60.8	1.11	—3.19	4
June	79.5	+2.1	100	90.9	54	68.1	3.25	—1.07	8
July	78.4	—1.7	100	91.	54	65.7	2.74	—1.44	7
August	81.7	+2.6	105	93.8	62	69.6	5.07	+ .87	10
September	68.2	—5.5	95	80.4	42	56.	3.37	— .15	7
October	67.	+5.2	91	77.3	34	56.6	3.84	+1.65	6
Total rainfall for ten months							35.11	—8.55	67

Table 8—VARIETY STUDIES ON VALLEY LAND, HOLLY SPRINGS BRANCH STATION, 1918

VARIETY	Plat yields Sept. 9.	Plat yields Sept. 22	Plat yields Dec. 1.	Total seed cotton per plat.	Seed cotton per acre.	Per cent lint.	Length of lint in inches.	Pounds of lint per acre.	Value of lint per lb in cents.	Value of seed at $68 a ton.	Value of lint.	Total money value.	Rank in money value.
Simpkins	55.5	10.2	8.	73.2	1187.3	34.2	3/4	407	30.25	26.53	123.12	149.65	24
Trice (Tenn. Sta.)	55.7	6.	6.7	68.5	1111.0	32.2	1	358	31.50	25.60	112.77	138.37	26
Dodd's Prolific	53.5	17.2	11.	81.7	1325.1	32.3	1	428	31.50	30.50	134.82	165.32	20
Pedigreed Wannamaker-Cleveland	47.5	34.	17.7	99.2	1609.	38.7	3/4	623	30.25	33.52	188.46	221.98	2
Commercial Wannamaker-Cleveland	47.7	32.5	19.	99.2	1609.	36.9	7/8	594	31.25	34.51	185.62	220.13	3
Cleveland Big Boll	38.7	30.5	19.2	88.5	1435.4	37.2	7/8	534	31.25	30.65	166.87	197.52	8
Cook—1010	53.7	26.7	17.5	98.	1589.5	40.4	3/4	642	30.25	32.22	194.20	226.42	1
Half & Half	32.7	31.7	35.	99.5	1613.8	36.7	3/4	592	30.25	34.74	179.08	213.82	5
Mexican Big Boll	54.7	23.7	14.2	92.7	1503.5	36.	7/8	541	31.25	32.73	169.06	201.79	7
Sunbeam	51.7	21.7	16.7	90.2	1463.	35.2	7/8	515	31.25	32.23	160.94	193.17	10
College No. 1	49.2	22.5	16.	87.7	1422.4	36.2	7/8	515	31.25	30.85	160.94	191.79	12
Mebanes Triumph	33.2	21.2	20.	74.5	1208.3	38.9	1	470	31.50	25.10	148.05	173.15	18
Rowden	15.2	20.2	47.5	83.	1346.2	38.6	1	520	31.50	28.09	163.80	191.89	11
Miller	45.5	32.5	20.	98.	1589.5	34.8	1	553	31.50	35.24	174.19	209.43	6
Lone Star—15	45.5	19.7	14.	79.2	1284.6	36.7	1 1/16	471	32.75	27.62	154.25	181.87	16
Lone Star—132	51.5	18.	11.	80.5	1305.7	30.7	1 1/8	401	33.25	30.76	133.33	164.09	21
Lone Star—132-467	34.	20.5	21.7	76.2	1235.9	25.9	1 3/16	320	35.75	31.14	114.40	145.54	25
Express—122-4104	60.2	14.7	9.	84.	1362.4	29.9	1 3/16	407	35.75	32.48	145.50	177.98	17
Express—350	59.	13.7	11.5	84.2	1365.7	31.2	1 3/16	426	35.75	31.95	152.29	184.24	13
Express—122-475	45.	22.5	14.	81.5	1321.9	31.4	1 1/16	415	32.75	30.83	135.91	166.74	19
Express—122-433	51.2	14.2	10.7	76.2	1235.9	29.8	1 3/16	368	35.75	29.51	131.56	161.07	22
Express—432	56.7	18.7	21.	96.2	1560.5	33.6	1 1/8 full	524	34.50	35.23	180.78	216.01	4
Columbia	45.5	25.	18.	88.2	1430.6	32.	1 3/16	458	35.75	33.07	163.73	196.80	9
Foster—11	53.7	17.5	9.5	80.7	1308.9	32.5	1 3/16	425	35.75	30.02	151.94	181.96	15
Foster—120-449	50.7	11.2	8.2	70.2	1138.6	32.9	1 1/8	375	33.25	25.97	124.69	150.66	23
Webber—49	35.5	28.7	17.7	82.	1330.	32.	1 3/16	425	35.75	30.77	151.94	182.71	14

Cotton Spacing Work, 1918.

The cotton in the spacing test for 1918 was planted May 4 on slightly rolling hill land, with 200 pounds of acid phosphate and 200 pounds of cotton seed meal per acre used as fertilizers. The yields are about 2-3 normal yield. Table 9 shows in detail the yields for the different distances used. The closest spacing gives best yields in every case.

Table 9—COTTON SPACING TEST

VARIETIES	3 ft. rows 9 inches in drill.	3½ ft. rows 12 inches in drill.	4 ft. rows 9 inches in drill.	4 ft. rows 12 inches in drill.
Wannamaker-Cleveland	1400	1320	1239	1096
Cleveland Big Boll	1435	1216	1107	1128
Sherard's Columbia	1330	1140	1036	990
Average per plat	1388	1240	1127	1071

NOTES ON WORK WITH VARIETIES OF COTTON AT POPLARVILLE, MISSISSIPPI, IN 1918.

By E. B. Ferris.

Work with varieties of cotton was conducted at Poplarville on land of unknown history, but which had corn the year before. The land was sandy loam with sandy clay subsoil, and was typical of the long leaf pine belt. It was first flat broken and laid off into rows 3 1-2 feet apart, fertilized with a mixture of acid phosphate and cottonseed meal at the rate of 400 pounds per acre; this fertilizer was mixed with the soil and bedded upon. The rows were dragged down nearly flat and on April 23 the 19 varieties of cotton were planted with a Ledbetter one-seed planter. The land used for growing this cotton was about 75x640 feet, almost level; and for planting, the land was divided lengthwise in four square parts with a 3-foot space separating the four subdivisions. Nineteen rows were in each plat, these rows being one-eightieth of an acre. The several varieties were so arranged in each of the four subdivisions as to do away as nearly as possible, with variations in yields due to inequalities of the soil. This cotton was hoed twice and so thinned as to leave, as nearly as possible, one stalk every 15 inches in the drill. This arrangement gave four rows, each one-eightieth of an acre, the four rows making one-twentieth of an acre. Each row was tagged so that after the picking the four rows tagged the same were weighed together.

Table 10—TEMPERATURE AND RAINFALL, McNEILL, MISS., 1918*

MONTH	Mean temperature.	Departure from the normal temperature.	Highest temperature.	Average maximum temperature.	Lowest temperature.	Average minimum temperature.	Total precipitation in inches.	Departure from the normal in precipitation.	No. days precipitation occurred.
January			73	56.5	14		5.72	+1.12	8
February					31		2.28	—2.96	5
March	65.2	+3.6	85	74.7	45	55.6	1.85	—3.09	4
April	65.5	—2.8	86	74.8	36	56.2	6.97	+1.53	10
May	74.2	+ .6	91	84.6	50	63.8	2.27	—3.72	5
June	82.6	+2.9	99	94.	67	71.2	3.63	—1.78	8
July	81.4	+ .8	99	93.	63	69.8	6.27	—3.16	11
August	80.1	— .9	100	91.6	58	68.6	3.10	—3.57	13
September	75.	—2.6	96	87.7	46	62.4	1.25	—4.93	1
October	73.1	+5.1	93	82.8	46	63.4	10.91	+8.02	11
Total rainfall for ten months							44.25	—13.66	

*McNeill is but a few miles from Poplarville.

No cotton had been grown on this land for several years and there was practically no wilt to be seen, so that no observations were made for wilt. For the same reason, with the additional fact that the year was extremely dry, there was little or no trouble from the boll weevil and we kept no data as to the time the first weevil was seen. In midsummer we made a search for weevils and found none, but in the early fall there were evidences of them, though few squares were punctured that would have had time in normal seasons to make mature bolls.

When the cotton was well opened and before any of it was picked, I went over the plats with Prof. Hurst, of the local Agricultural High School, and the variety, Express-122-433, was pronounced by both of us to be the best of the lot, whether by accident or not, we could not tell. The year 1918 was exceptionally dry and favorable to growing cotton under boll weevil conditions. In former tests we had, under boll weevil conditions, got best results from Trice, followed closely by other varieties that ripened early.

Table 11 gives yields and various other facts pertaining to the varieties of cotton grown.

Table 11—VARIETY STUDIES AT POPLARVILLE BRANCH STATION, 1918

VARIETY	Plat yields Aug. 30.	Plat yields Sept. 25	Total plat yields.	Pounds of seed cotton per acre.	Per cent lint.	Length of lint in inches.	Pounds of lint per acre.	Value of lint per lb in cents	Value of lint.	Value of seed at $68 a ton.	Total money value.	Rank in money value.
Simpkins	46	10	56	1120	32.	3/4	358	30.25	$108.29	$25.91	134.20	15
Trice (Tenn. Sta.)	48	12	60	1200	32.	1	384	31.50	120.96	27.74	148.70	11
Trice—270-41	54	7	61	1220	31.	1 1/16	378	32.75	123.79	28.63	152.42	**9**
Dodds' Prolific	40	7	47	940	32.7	1	307	31.50	96.70	21.52	118.22	**17**
Wannamaker-Cleveland	41	14	55	1100	37.	7/8	407	31.25	127.19	23.56	150.75	10
Cleveland Big Boll	30	43	73	1460	36.	7/8	526	31.25	164.37	31.76	196.13	3
Cook—1010	36	39	75	1500	41.	3/4	615	30.25	186.04	30.09	216.13	**2**
Sunbeam	37	8	45	900	34.	3/4	306	30.25	92.56	20.20	112.76	18
Rowden	26	39	65	1300	34.	1 1/16	442	32.75	144.75	29.17	173.92	5
Lone Star—15	45	16	61	1220	36.	1 1/16	439	32.75	143.77	26.55	170.32	6
Triumph	28	33	61	1220	37.5	1 1/16	558	32.75	149.99	25.91	175.90	4
Lone Star—132	32	37	69	1380	28.3	1 1/8	391	33.25	130.00	33.63	163.63	8
Express—122-433	42	47	89	1780	28.1	1 3/16	500	35.75	178.75	43.52	222.27	1
Express—350	43	8	51	1020	29.3	1 3/16	299	35.75	106.89	24.51	131.40	16
Express—432	55	7	62	1240	32.7	1 1/8 full	405	34.50	139.72	28.39	168.11	7
Columbia	35	20	55	1100	29.1	1 3/16	320	35.75	114.40	26.52	140.92	13
Webber—49	34	18	52	1040	30.3	1 3/16	315	35.75	112.61	24.65	137.26	14
Foster—120	44	9	53	1060	31.5	1 3/16	334	35.75	119.40	24.68	144.08	12
Meade	29	16	45	900	23.5	1 3/8	212	40.75	86.39	23.39	109.78	19

VARIETY TEST AT THE DELTA BRANCH STATION, 1918.

By G. B. Walker and H. B. Brown.

The cotton in this test was planted April 10, on rather thin loam land that had been in cotton for some years. Nitrate of soda at the rate of 100 pounds per acre was applied about the time blooming started. It was necessary to replant skips by hand in order to get a good stand. Boll weevils did practically no damage. A few punctured squares were found on the farm the first of July, but weevils were not plentiful enough to have much effect until the very last of August. By that time blooming had about ceased on account of the dry weather. The prolonged dry weather not only retarded vegetative growth but checked blooming and fruiting.

Table 12—TEMPERATURE AND RAINFALL, GREENVILLE, MISS., 1918*

MONTH	Mean temperature.	Departure from the normal temperature.	Highest temperature.	Average maximum temperature.	Lowest temperature.	Average minimum temperature.	Total precipitation in inches.	Departure from the normal in precipitation.	No. days precipitation occurred.	Total precipitation in inches at Stoneville.
January	36.6	—12.	71	44.5	—1	22.8	3.97	— .74	11	3.49
February	50.3	+3.5	88	63.2	23	37.4	1.39	—3.20	7	1.10
March	60.5	+4.9	86	73.9	34	47.1	1.29	—4.23	5	1.03
April	62.2	—2.1	86	73.5	32	50.9	5.96	+1.70	10	6.27
May	74.	+2.	94	86.4	42	61.5	.95	— .46	4	.89
June	81.8	+2.2	102	94.2	55	69.5	2.75	— .97	7	3.31
July	80.3	—1.7	102	94.7	55	65.9	1.06	—2.96	4	1.23
August	82 5	+1.2	103	95.2	62	69.8	2.91	—1.02	5	2.52
September	76.3	—5.9	96	84.3	41	56.3	3.32	+ .14	8	3.32
October	68.6	+ 4.	93	78.8	36	58.4	4.43	+2.31	14	4.61
Total rainfall for ten months							28.03	—9.43	75	27.77

*This table gives temperatures and rainfall for Greenville, Miss., and rainfall for Stoneville. The Experiment Station is located at Stoneville, which is nine miles from Greenville.

Table 13—VARIETY STUDIES DELTA BRANCH STATION, 1918

VARIETY	Pounds of seed cotton per plat.	Pounds of seed cotton per plat for perfect stand	Pounds of seed cotton per acre for perfect stand	Per cent lint.	Pounds of lint per acre.	Length of lint.	Value of lint per lb in cents.	Value of lint.	Value of seed at $68 a ton.	Total money value per acre.	Rank in money value.
Dodds Prolific	64	67.2	1478	31.2	461	1	31.50	145.21	34.58	179.79	37
Trice (Tenn. Sta.)	69	72.0	1584	30.5	483	1	31.50	157.30	37.43	194.73	28
Trice—270-41	64	68.8	1514	30.7	465	1 1/16	32.75	152.79	35.67	188.46	33
Wannamaker-Cleveland	72	76.6	1685	37.2	627	7/8	31.25	199.66	35.97	235.63	4
Cleveland Big Boll	65	71.1	1564	35.0	547	7/8	31.25	186.75	34.58	221.33	9
Cook—1010	73	78.3	1723	41.4	713	3/4	30.25	215.68	34.34	250.02	1
College No. 1	63	65.9	1450	34.6	502	3/4	30.25	151.85	32.23	184.08	35
Sunbeam	67	70.0	1540	33.2	511	3/4	30.25	154.78	34.99	189.77	32
Mexican Big Boll	74	75.8	1668	34.0	567	7/8	31.25	177.19	37.43	214.62	14
Triumph	67	70.9	1560	38.6	602	1 1/16	32.75	197.15	32.57	229.72	5
Miller	62	67.1	1476	34.4	508	1	31.50	160.02	32.91	192.93	31
Lone Star—15	65	72.2	1588	33.2	527	1	31.50	166.00	36.07	202.07	24
Polk	65	68.4	1505	29.0	436	1 1/8	33.25	144.97	36.35	181.32	36
Express—350	69	75.0	1650	29.1	480	1 1/8	33.25	159.60	39.78	199.38	25
Express—122-433	69	74.3	1635	29.2	477	1 1/8	33.25	158.60	39.37	197.97	26
Express—122-475	70	81.2	1786	29.5	527	1 1/16	32.75	172.59	42.81	215.40	12
Express—122-4104	66	75.7	1665	28.3	471	1 1/8 full	34.50	162.49	40.60	203.09	23
Express—432	80	84.0	1848	32.6	602	1 1/8	33.25	200.16	42.36	242.52	2
Wolcott's Express	70	77.2	1698	30.3	514	1 1/8	33.25	170.90	40.26	211.16	15
Lone Star—132	65	74.4	1637	28.3	463	1 1/8	33.25	153.95	39.92	193.87	29
Lone Star—132-48	72	77.9	1714	31.4	538	1 1/8 full	34.50	185.61	39.98	225.59	7
Lone Star—132-467	66	77.4	1703	27.3	465	1 1/8	33.25	154.61	42.09	196.70	27
Magnolia	69	80.6	1773	27.5	488	1 1/8	33.25	162.26	43.69	205.95	21
Kekchi	65	74.5	1639	32.6	534	1 1/8	33.25	177.55	37.57	215.12	13
Express—Simpkins	60	72.1	1586	32.5	515	1 1/8	33.25	171.75	36.41	208.16	17
Archer	83	86.1	1894	28.7	544	1	31.50	171.36	45.90	217.26	11
Columbia	72	76.1	1674	29.6	496	1 1/8	33.25	164.92	40.05	204.97	22
Webber—49	68	74.9	1648	31.3	516	1 3/16	35.75	184.47	38.49	222.96	8
Foster—120	55	64.5	1419	31.3	444	1 1/8 full	34.50	153.18	33.15	186.33	34
Foster—120-4101	61	69.5	1529	31.1	476	1 3/16	35.75	170.17	35.80	205.97	20
Foster—120-482	71	75.2	1654	28.9	478	1 3/16	35.75	170.88	39.98	210.86	16
Foster—120-449	55	67.7	1489	32.1	478	1 1/8	33.25	158.93	34.37	193.30	30
Foster—11	71	75.2	1654	31.7	524	1 3/16	35.75	187.33	38.42	225.75	6
Sparkman	65	70.5	1551	30.6	475	1 3/16	35.75	169.81	36.58	206.39	19
Sunflower	80	82.8	1822	29.6	539	1 3/16	35.75	192.69	43.62	236.31	3
Allen's Long Staple	70	71.6	1575	27.1	427	1 1/4	39.25	167.60	39.03	206.63	18

Table 13 gives yields and considerable other data that will be of interest to cotton growers. Here, as in most of the other tests made this year, the extra early varieties made a comparatively poor showing while the big boll varieties, excepting College No. 1, and Sunbeam, ranked well. Seed of these two varieties was brought from Georgia and it is possible that their poor showing was due to their not being acclimated.

VARIETY STUDIES AT CLARKSDALE, 1918.

The cotton in this experiment was planted April 17, on buckshot soil. It came up to a good stand but the plants failed to make the usual vegetative growth due to prolonged dry weather. No weevils were found in the plats during the season. Wilt damaged Trice, Foster, and Lone Star considerably.

Table 14—VARIETY STUDIES, CLARKSDALE, 1918

VARIETY	Pounds of seed cotton per plat.	Pounds of seed cotton per acre.	Per cent lint.	Pounds of lint per acre.	Length of lint.	Value of lint per lb in cents.	Value of lint.	Value of seed at $68 a ton.	Total money value.	Rank in money value.
Trice—270-41	103.	1133	30.7	348	1 1/16	32.75	113.97	26.69	140.66	13
Wannamaker-Cleveland	123.9	1363	37.2	507	7/8	31.25	158.44	29.10	187.54	1
Miller	114.	1254	34.4	431	1	31.70	136.63	27.98	164.61	6
Lone Star—15	126.	1386	33.2	460	1	31.50	144.90	31.48	176.38	3
Lone Star—132-48	106.	1166	31.4	366	1 1/8 full	34.50	126.27	27.20	153.47	9
Lone Star—132	116.5	1282	28.3	363	1 1/8	33.25	120.70	31.25	151.95	11
Express—432	128.	1408	32.6	459	1 1/8	33.25	152.62	32.27	184.89	2
Polk	115.5	1271	29.	369	1 1/8	33.25	122.69	30.67	153.36	10
Webber—49	111.	1231	31.3	385	1 3/16	35.75	137.64	28.76	166.40	5
Foster—11	100.	1100	31.7	349	1 3/16	35.75	124.77	25.53	150.30	12
Webber—82	112.	1232	30.9	381	1 3/16 full	37.75	143.83	28.93	172.76	4
Sunflower	111.9	1231	29.6	364	1 3/16	35.75	130.13	29.48	159.61	7
Mitchell	103.	1133	27.5	312	1 3/8	40.75	127.14	27.91	155.05	8

GENERAL DISCUSSION.

Fruiting of Cotton Varieties.

Table 15—FRUITING OF COTTON VARIETIES

VARIETY	Blossoms produced on 100 plants.	Bolls retained.	Percentage of bolls retained.
Dodds Prolific	5585	2184	39.1
Trice (Tenn. Sta.)	5064	1801	35.4
Trice (Ark. Sta.)	5367	2058	38.3
Trice—270-41	5638	2226	39.4
Wannamaker-Cleveland	3820	1865	48.8
Cleveland 43	4382	1893	43.1
Cleveland Big Boll	3654	1602	43.8
Cook—1010	3994	1509	39.2
College No. 1	4094	1660	40.5
Sunbeam	4395	1776	40.4
Mexican Big Boll	4545	1845	40.5
Triumph	3005	1044	34.7
Miller	2953	1098	37.1
Lone Star—15	3623	1482	40.9
Polk	4777	2263	47.3
Express—350	4464	1994	44.6
Express—122-433	4391	1971	44.8
Express—412	4675	1858	39.7
Express—122-457	4981	2077	41.6
Express—432	4371	2265	51.8
Express—122-475	4283	2183	50.9
Lone Star—132-48	4140	1323	31.9
Lone Star—132	4572	1559	34.0
Lone Star—132-467	4287	1320	30.7
Magnolia	4925	1814	36.8
Columbia	4506	1886	41.8
Express—Simpkins	4840	1652	34.1
Kekchi	3629	1379	37.9
Webber—49	4336	1653	38.1
Foster—120-449	4025	1284	31.9
Foster—120-4101	4352	1442	33.1
Foster—120-480	4626	1613	34.8
Foster—120	3980	1358	34.1
Foster—11	4521	1345	29.7
Sunflower	5591	2160	38.6

Different cotton varieties exhibit considerable range in their rate of blooming. Table 15 gives the number of flowers produced by 100 plants of each of the varieties and strains grown in the College Station test in 1918. It will be noted that the range is from 2953 to 5638, Miller being the lowest and Trice-270-41 the highest. Miller, however, made a satisfactory yield since the bolls produced were large and a fair percentage of them retained.

The percentage of bolls retained varied considerably, ranging from 29.7 for Foster-11 to 51.8 for Express-432. The extra early varieties were damaged more by the dry weather than others and consequently did not retain as many of their bolls as they would have during normal years. Boll weevils caused the loss of a good many forms but presumably they damaged all varieties ailke. Retaining a high percentage of forms is a good quality in strain of cotton and is an indication of vigor and high yielding power.

The curves in Figure 1 show graphically the relation between the blooming and shedding of the varieties grown. These curves have the same general trend, indicating some correlation. The curves for Dodd's Prolific and Trice are widely separated. The blooming rate of these early varieties is high but the percentage of forms held rather low. The big boll varieties next in the list have the two curves rather near together with the retention curve the higher. Wannamaker-Cleveland in this list stands out conspicuously, the retention curve being unusually high. Among the long staple cottons, Polk and Express-432 and Express-122-475 are conspicuous in the same way. The retention curve for the different strains of Lone Star and Foster is abnormally low because of wilt diseased plants within their rows.

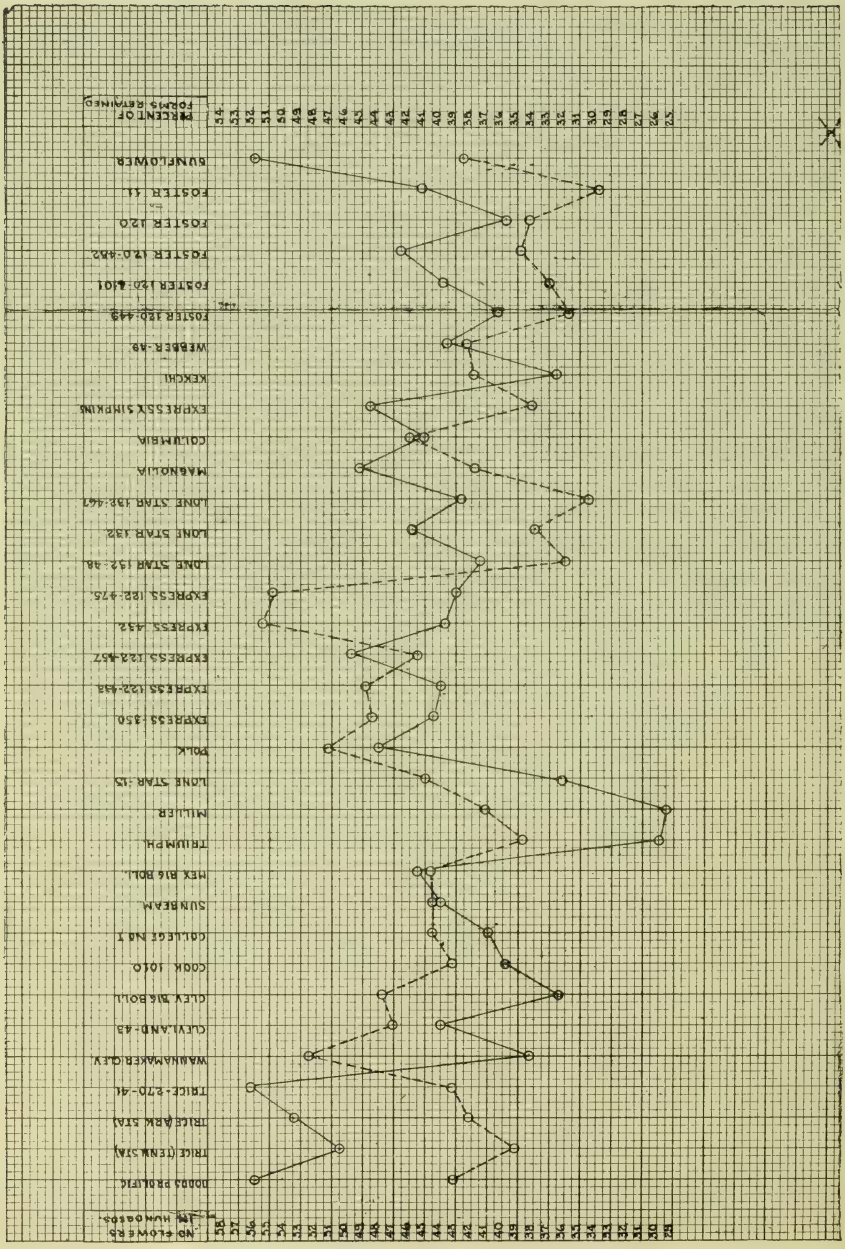

FIGURE 1.—Curves showing relation of flowering and shedding. Flowers, solid

Relation of Germination to Size of Seed.

Most cotton growers have probably observed that it is more difficult to obtain a stand of cotton if the seed planted are large. The relation that the size of the seed planted bears to the rate of germination is shown graphically in figures 2 and 3. In general the same general trend and in most instances the dips and rises follow each other. Exceptions in the case of individual varieties may be explained by defects in quality of seed.

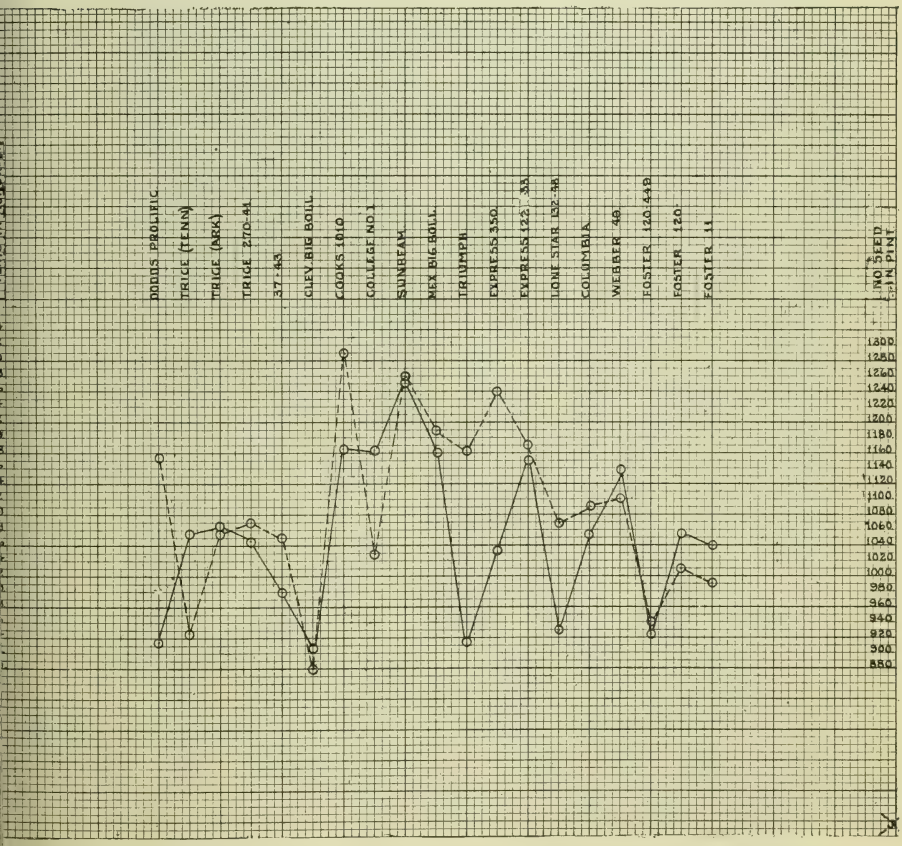

FIGURE 2.—Curves showing relation of number of seedlings produced in 1917 and size of seed planted.
Number of seedlings in plots, solid line; number of seeds in a pint, broken line.

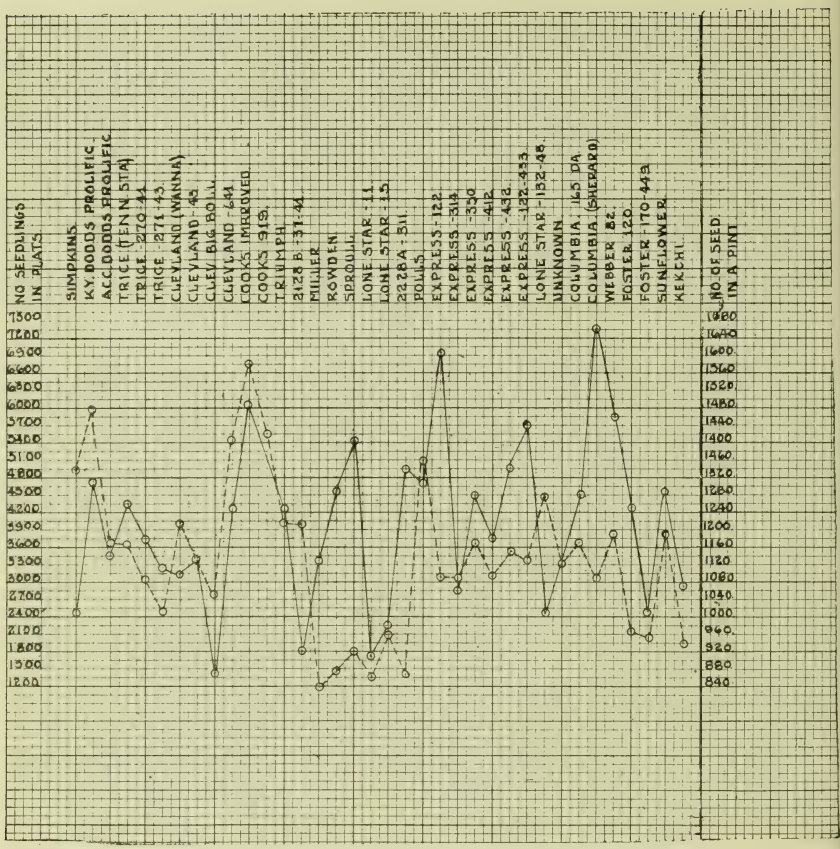

FIGURE 3.—Curves showing relation of size of seed to germination. 1918 data. Number of seedlings, solid line; number seed in a pint, broken line.

Use Home Grown Seed.

Seed dealers in some of the cotton growing states north of Mississippi have advocated rather freely the use of northern grown cotton seed in Mississippi, claiming that it would produce earlier plants and better yields where there were boll weevils.

Recent experiments carried on at the College Station indicate that home grown seed produces not only slightly earlier, but better yielding plants than seed of the same variety when brought from North Carolina.

In 1913 seed were saved by Dr. Winters from a certain plant growing in a field of King cotton on the Experiment Station farm at West Raleigh, North Carolina. In 1914 and 1915 progenies from this 1913 selection were grown at West Raleigh and the plants selfed each year. In 1916, the seed of the strain was divided, a part being planted at Agricultural College, Mississippi, and the

rest at West Raleigh. In 1917 and 1918 seed of the strain grown in Mississippi since 1916 was planted in rows alternating with rows planted with seed of the direct from North Carolina and comparisons made. It was found that the plants coming from Mississippi grown seed were taller both at blooming time and at maturity, that they had more fruit branches, did more blooming, produced more bolls, and yielded more seed cotton than the plants grown from North Carolina seed. The lint percentage for the two strains seemed to be about the same while the staple length of the Mississippi strain was slightly longer.

COTTON GINNED PRIOR TO DECEMBER 1, CROPS OF 1918 AND 1917 IN MISSISSIPPI.*

(Quantities are in running bales, counting round as half bales. Linters are not included.)

County.	1918.	1917.	County.	1918.	1917.
The State	894,666	728,859	Neshoba	6,471	3,361
Adams	4,047	2,629	Newton	6,430	3,054
Alcorn	6,136	3,356	Noxubee	12,942	10,986
Amite	9,217	9,031	Oktibbeha	4,218	2,351
Attala	7,130	4,225	Panola	18,892	13,174
Benton	4,421	2,375	Pike	8,111	8,696
Bolivar	80,357	91,098	Prentiss	5,325	2,902
Carroll	8,219	6,133	Quitman	23,821	17,741
Chickasaw	9,317	5,368	Rankin	5,471	2,722
Claiborne	6,747	6,430	Scott	5,020	2,372
Clay	7,176	3,842	Sharkey	12,883	14,728
Coahoma	51,955	51,769	Simpson	7,005	4,764
Copiah	8,156	5,141	Smith	7,852	3,762
Covington	5,202	3,174	Sunflower	61,176	66,194
DeSoto	20,586	11,282	Tallahatchie	30,788	27,800
Franklin	4,407	3,595	Tate	14,661	9,350
Grenada	7,949	4,242	Tippah	4,428	3,330
Hinds	24,136	20,106	Tishomingo	4,615	2,108
Holmes	26,794	24,147	Tunica	21,709	17,850
Issaquena	4,731	4,843	Union	5,246	2,829
Jasper	5,712	3,004	Walthall	5,767	5,509
Jefferson	8,822	6,862	Warren	8,393	5,723
Jefferson Davis	8,407	6,875	Washington	51,447	50,789
Jones	6,597	3,937	Wayne	3,175	1,875
Kemper	6,303	2,770	Webster	4,978	1,742
Lawrence	8,042	7,813	Wilkinson	5,144	3,547
Leake	6,956	4,304	Yalobusha	6,035	2,653
Lee	13,469	6,857	Yazoo	26,964	27,941
Leflore	44,166	39,365	All other	38,367	16,417
Lincoln	8,611	7,240			
Lowndes	7,789	5,548			
Madison	18,633	14,694			
Marion	5,108	2,538			
Marshall	14,118	8,297			
Monroe	12,083	6,777			
Montgomery	5,833	2,922			

In 1917, eighty-two per cent of the total crop was ginned prior to Dec. 1.

*From reports issued by Department of Commerce, Washington, D. C.

SOURCE OF SEED.

Below is a list of the sources from which seed of the varieties tested was obtained:

Adair No. 1	T. P. Adair, Ruleville, Miss.
Allen's Long Staple	J. B. Allen, Port Gibson, Miss.
Archer	Ires-Archer Cotton Co., Greenville, Miss.
Cleveland (Wannamaker)	W. W. Wannamaker Seed Co., St. Mathews, S. C.
Cleveland Big Boll	J. R. Cleveland, Decatur, Miss.
Cleveland—43	Miss. Experiment Station
Cook—1010	Alabama Experiment Station, Auburn, Ala.
College No. 1	University of Ga., Athens, Ga.
Columbia	J. H. Sherard, Sherard, Miss.
Council-Toole	Georgia Board of Entomology, Atlanta, Ga.
Covington-Toole	J. E. Barr, Clio, Alabama
Cook—307-6	Ala. Experiment Station, Auburn, Ala.
Dodd's Prolific	S. L. Dodds, Hickman, Ky.
Dixie Improved	Georgia Board of Entomology, Atlanta, Ga.
Dix-Afifi	Georgia Board of Entomology, Atlanta, Ga.
Express—432	Miss. Experiment Station
Express—350	Miss. Experiment Station
Express—122-433	Miss. Experiment Station
Express—122-457	Miss. Experiment Station
Express—122-475	Miss. Experiment Station
Express Simpkins	Miss. Experiment Station
Express—412	Miss. Experiment Station
Express Covington-Toole	Miss. Experiment Station
Express—122-4104	Miss. Experiment Station
Express (Wolcott's)	C. D. Wolcott, Hollandale, Miss.
Foster—120	Miss. Experiment Station
Foster—120-4104	Miss. Experiment Station
Foster—120-482	Miss. Experiment Station
Foster—120-449	Miss. Experiment Station
Foster—11	Miss. Experiment Station
Half & Half	Willett Seed Co., Augusta, Ga.
Kekchi	Bureau of Plant Industry, Washington, D. C.
Lewis—63	State Board of Entomology, Atlanta, Ga.
Lone-Star—132	Miss. Experiment Station
Lone-Star—132-48	Miss. Experiment Station
Lone-Star—132-467	Miss. Experiment Station
Lone-Star—15	Miss. Experiment Station
Mitchell	Dr. Jas. Lacy, Lyons, Miss.
Meade	Bureau of Plant Industry, Washington, D. C.
Magnolia	J. B. Allen, Port Gibson, Miss.
Miller	A. D. Miller, Blue Springs, Miss.
Mexican Big Boll	O. H. Bales, R. R. No. 12, Charlotte, N. C.
Polk	Dr. Jas. Lacy, Lyons, Miss.
Rowden	Rowden Bros., Wills Point, Texas
Sunbeam	Willett Seed Co., Augusta, Ga.
Sparkman	Dr. Sparkman, Cleveland, Miss.
Sunflower	Marx Schaefer, Yazoo City, Miss.
Simpkins	Miss. Experiment Station
Tri-Cook	Ala. Experiment Station, Auburn, Ala.
Triumph	A. D. Mebane, Lockhard, Texas
Trice—270-41	Miss. Experiment Station
Trice (Ark.)	Arkansas Experiment Station, Fayetteville, Ark.
Trice (Tenn.)	West Tenn. Experiment Station, Jackson, Tenn.
Webber—49	Coker Seed Co., Hartsville, S. C.
Webber—82	Coker Seed Co., Hartsville, S. C.
37W—54	Miss. Experiment Station

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F. J. TEBBS ..... Foreman, Beef Cattle
M. E. WINFIELD ..... Foreman, Hogs and Sheep
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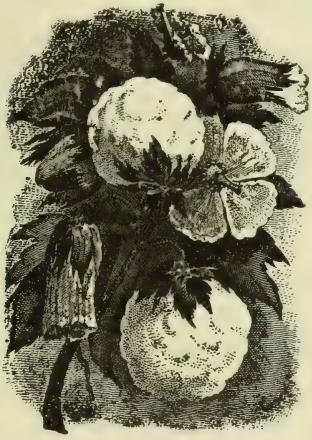
BULLETIN No. 187
DECEMBER, 1920

COTTON EXPERIMENTS 1919 and 1920

BY
H. B. BROWN AND C. B. ANDERS



Mississippi Agricultural Experiment Station
AGRICULTURAL COLLEGE, MISSISSIPPI

J. R. RICKS,
DIRECTOR

SUMMARY AND RECOMMENDATIONS

The Weather. In many parts of the State, wet weather during June and July, 1919, made the proper cultivation of cotton impossible and thus reduced yields materially in 1919. Unfavorable weather during the spring of 1920 was also a hindrance to the 1920 production.

Boll Weevil Damage. Boll weevils did much damage over the State as a whole during both 1919 and 1920. The crop was completely ruined in places in the southern part of the State.

Rank of Varieties. Early varieties made the best yields on account of the short fruiting period; long staple varieties led in money value due to extra premium paid for staple cotton.

Good Varieties. For thin hill land, Cleveland and Miller; for rich hill land that is not infected with wilt, Trice; for Delta and valley land, free from wilt, if weevil infestation is heavy, Express, Trice, and Foster; for valley land with light wilt infection and light weevil infestation, Cleveland, Express, and Columbia; for heavy wilt infection and few or no weevils, Tri-Cook and Lewis-63; for heavy wilt infection and heavy weevil infestation, no variety; grow some other crop.

Oil Content of Cotton Seed. An analysis of the seed of twenty-five different varieties of cotton grown in the same field showed a wide variation in oil content, some containing more than twelve gallons per ton more than others.

Weevil Control. Experiments with calcium arsenate powder in poisoning boll weevils showed that under certain conditions this poison could be used profitably in controlling weevils in cotton on valley land in the Hill section of the State.

COTTON EXPERIMENTS, 1919

By H. B. BROWN and C. B. ANDERS

INTRODUCTION.

The field covered by this report is similar to that covered in other annual cotton bulletins. Variety study results from tests conducted on different soils are reported and an effort made to give the main environmental conditions under which the cotton was grown, as soil fertility, rainfall, temperature, weevil infestation, plant diseases, etc.

In addition to the variety work, results from certain other experiments and other data of general interest to cotton growers are included.

The season of 1919 was abnormal in respect to weather conditions, weevil infestation, etc., and consequently results are more or less abnormal. Some varieties that commonly do well failed to make a good showing. Certain types fit one set of conditions and do well, while other types are adapted to other conditions. In general a variety of certain type, if pure, will perform approximately the same under similar conditions wherever grown. If it were possible to predict what conditions were going to prevail any particular year, it would be easy to say what would be the best variety to plant. Extra early varieties best suited conditions during the 1919 season. The unusual premium paid for staple cottons made them leaders in money value.

Differences of a few dollars in total money value or a few places in rank are without significance since they come within the range of experimental error. A duplicate test conducted under similar conditions might show slightly different ranking.

Seed of the best of the new strains developed by the Experiment Station will be distributed as soon as they can be multiplied in quantity.

The Weather.

Over the State as a whole, the weather during the growing season of 1919 was unfavorable for the growing of cotton successfully under boll weevil conditions. Eight of the ten months from January to October had more than average rainfall. The rainfall during October was 4.52 inches above the average. The frequency of moderate to heavy precipitations hindered picking during October, and much cotton was damaged in the field. Killing frosts did not occur until the middle of November. This delay gave late cotton a good chance to develop, but it was also favorable to boll weevils, allowing many to go into hibernation late in the season.

Boll Weevils.

Except in the extreme northern counties, boll weevils appeared rather early over most of the State. In a few northern counties, none were seen during the entire season. Several southern counties reported weevils when cotton first came up. Continued wet weather over the southern half of the State favored the weevils, and as a consequence they did more damage than during the two preceding years. Boll weevils are largely the limiting factor to cotton production in Mississippi, and precipitation is the chief factor which influences weevil

production. In localities where the weather is dry during July and August, the crop is usually good, but where it is wet during these months, a partial to total failure results.

The cotton in the tests at the four experiment stations was subjected to weevil injury ranging from very heavy infestation to none. At the South Mississippi Station the crop was practically ruined; at the Delta Station damage was less than at the College Station; at the Holly Springs Station there was no weevil damage at all.

Cotton Leafworm.

The Cotton Leafworm (*Alabama argillacea*), also called cotton army worm, appeared in most of the cotton fields of the State during August or September. This insect in its adult form is a small, tawny colored moth. It is a native of tropical regions and is known to fly long distances. This accounts for its sudden appearance certain seasons, and its widespread distribution over the State.

Except in some of the northern counties, the cotton leafworm in 1919 was an aid rather than a hindrance. Cotton had about stopped fruiting in most regions, due to the ravages of the boll weevil before the advent of the leafworm. The leafworms were helpful in that they stripped the foliage from rank plants allowing the sun to reach the bolls, dry them out, stop boll rot, and bring about earlier opening. They were harmful in sections where plants bearing immature bolls were stripped of foliage.

Classing.

Classing was done by the New Orleans Cotton Exchange and prices fixed by the John M. Parker Company, of New Orleans. The prices are based on the spot market at New Orleans for December 31, 1919, strict middling, white cotton of good character. The Experiment Station is greatly indebted to these firms for this service.

TABLE 1. VARIETY STUDIES ON VALLEY LAND, COLLEGE STATION, 1919

VARIETY	Pounds of seed cotton per plat	Pounds of seed cotton per acre	Per cent lint	Pounds of lint per acre	Length of staple	Value of lint per pound in cents	Value of lint	Value of seed at $75 a ton	Total money value	Rank in money value	Weight of 100 bolls in ounces
Simpkins	82.25	990.9	33.2	329.0	7/8	41	134.89	21.82	159.71	17	20
Trice (Ark. Sta.)	80.50	969.8	30.0	290.9	15/16	41½	120.72	25.46	146.18	23	25
Trice–271–43	98.75	1189.7	30.0	356.9	15/16	41½	148.11	31.23	179.34	12	22
Vandiver's Heavy Fruiter	67.75	816.3	32.2	262.8	1	42	110.37	20.76	131.13	28	27
Lewis' Prize	77.00	927.7	32.5	301.5	1	42	126.63	23.48	150.11	22	20
Half &Half*	57.25	689.7	34.1	235.2	7/8	41	96.43	17.04	111.60	32	23
Cook–588	79.75	960.8	36.5	350.7	3/4	40	140.28	22.88	163.16	15	27
Wannamaker–Cleveland	76.25	918.6	35.5	326.1	7/8	41	133.70	22.22	155.92	20	26
Cleveland–37W–54	79.50	957.8	35.0	335.2	7/8	41	137.43	23.35	160.78	16	25
Cleveland Big Boll	63.50	765.0	33.3	254.7	15/16	41½	105.70	19.14	124.84	29	29
Cleveland (Smith)	79.75	960.8	33.8	324.7	7/8	41	133.12	23.85	156.97	19	25
Mexican Big Boll	75.25	906.6	31.5	285.6	1	42	119.95	23.29	143.24	24	25
Sunbeam	73.75	888.5	32.0	284.3	7/8	41	116.56	22.66	139.22	25	24
Miller	65.50	789.1	33.1	261.2	1 1/16	45	117.54	19.80	137.34	26	34
Triumph	53.25	641.5	37.2	238.6	1 1/16	45	107.37	15.11	122.48	31	36
Lone Star–132–48	87.00	1048.2	31.2	327.0	1 1/8	50	163.50	27.04	190.54	9	26
Polk	65.12	784.6	28.3	222.0	1 3/16	60	133.20	21.10	154.30	21	20
Magnolia	77.75	936.7	27.6	258.5	1 3/16	60	155.10	25.43	180.53	11	21
Marshall	84.50	1018.0	27.2	276.9	1 3/16	60	166.14	27.79	193.93	8	20
Express–122–433	86.75	1045.1	27.5	287.4	1 3/16	60	172.44	28.40	200.85	5	21
Express–350	86.50	1042.1	28.3	294.9	1 3/16	60	176.94	28.02	204.96	3	21
Express–432	72.87	878.0	33.7	295.9	1 1/8	50	147.95	21.83	169.78	14	22
Foster–120–6102	93.37	1124.9	30.8	346.5	1 1/8	50	173.25	29.19	202.44	4	23
Foster–120–631	85.80	1033.7	30.4	314.2	1 3/16	60	188.52	26.98	215.50	1	25
Foster–120–698	87.00	1048.2	32.6	341.7	1 1/8	50	170.85	26.49	197.34	7	24
Foster–120	85.25	1027.1	30.2	310.2	1 3/16	60	186.12	26.88	213.00	2	26
Foster–11	80.75	972.9	29.7	288.9	1 3/16	60	173.34	25.65	198.99	6	24
Foster–120–66	75.75	912.6	30.0	273.8	1 3/16	60	164.28	23.95	188.23	10	26
Webber–49	65.30	786.7	29.1	228.9	1 3/16	60	137.34	20.92	158.26	18	25
Columbia	69.37	835.7	30.0	250.7	1 3/16	60	150.42	21.94	172.36	13	23
Sunflower	37.50	451.8	25.8	116.6	1 1/4	78	90.94	12.57	103.51	33	19
Allen	50.00	602.4	25.6	154.2	1 1/4	78	129.27	16.81	137.08	27	21
Meade	44.00	530.1	24.7	130.9	1 5/16	83	108.64	14.97	123.61	30	23

*Seed planted were not Half and Half probably, although bought for that.

Variety Studies on Valley Land, 1919.

The varieties in this test were planted April 22 on rather fertile soil, a part of the plats being on Houston clay and the rest on light sandy loam. There were six one-row plats of each variety. The weather following planting was favorable and an excellent stand secured. Unfavorable weather about the middle of May caused a good many of the young plants to die. This trouble was much worse on the loam plots than on the warmer Houston clay soil. There seemed to be some difference, too, in the resistance of different varieties. Miller and Triumph appeared to be resistant while certain other varieties, namely, Simpkins, Trice, Vandiver, and Half and Half, appeared to be unusually susceptible.

The first squares were observed on June 14, 53 days after planting, and the first blossom on July 2, which was 71 days after planting. The cool wet weather prevailing during part of May and June retarded the growth of cotton plants, making the blooming period later than usual.

Boll weevils were found in the plats June 20 and became rather numerous for an initial infestation, but they did not multiply as rapidly as was expected, maximum infestation not being reached until August 15 to 20. Weevils, however, did considerable damage, more in fact than during any year since 1916. This was a year when extra early varieties made a good showing. Seven of the ten best yielding varieties were among the ten ranking varieties in respect to number of open bolls August 27. The varieties flowering most, also, were in the majority among the leaders in yields.

VARIETY	Per cent. of seedlings damped off on sandy loam soil	Per cent. of seedlings damped off on Houston clay soil	Number of blooms on 200 plants in 1919	Number of bolls open Aug. 27 on 200 plants	Number of blooms on 100 plants in 1918
Simpkins	47.7	4.0	3514	40	.....
Trice, Ark. Sta.	17.0	2.3	3612	82	5367
Trice–271–43	.....	.....	3678	60	.....
Vandiver's Heavy Fruiter	20.7	4.6	2333	1	.....
Lewis' Prize	.....	.....	2612	15	.....
Half and Half	32.9	3.4	2407	4	.....
Cook–588	14.6	1.1	2317	6	.....
Wannamaker–Cleveland	15.2	3.1	2435	0	3820
Cleveland–37W–54	18.6	1.5	2735	14	.....
Cleveland Big Boll	.....	.....	2419	2	3654
Cleveland Smith	.....	.....	2817	22	.....
Mexican Big Boll	7.2	1.6	3321	20	4545
Sunbeam	.....	.....	2542	4	4395
Bennett	.....	.....	2091	3	.....
Miller	1.3	2.0	2243	2	2953
Triumph	0.9	2.6	1890	1	3005
Lone Star–15	7.8	1.8	2886	36	3623
Lone Star–132–48	7.5	1.2	3403	90	4140
Lone Star–132–48–61	.....	.....	3272	80	.....
Foster–120–61	.....	.....	2563	9	.....
Polk	1.5	1.1	3456	31	.....
Magnolia	.....	.....	3813	102	4925
Marshall	.....	.....	4961	62	.....
Express–122–433	3.6	1.3	3834	57	4391
Express–350	2.6	0.9	4047	194	4464
Express–350–630	.....	.....	2583	100	.....
Express–432	2.9	1.0	3784	85	4371
Foster–120–64	.....	.....	3350	56	.....
Foster–120–6102	.....	.....	4235	128	.....
Foster–120–631	.....	.....	3165	9	.....
Foster–120–698	.....	.....	4141	62	.....
Foster–120	1.4	1.5	3760	44	3980
Foster–11	3.9	1.3	3895	55	4521
Foster–120–66	.....	.....	3264	76	.....
Webber–49	6.9	3.8	3292	14	4336
Columbia	2.0	0.8	3251	28	4506
Sunflower	4.5	1.3	2977	26	5592
Allen	3.6	1.1	3034	11	.....
Meade	5.2	1.8	3464	3	.....

It was observed that less than half as many blossoms were produced in 1919 as in 1918. This difference was due largely to weevils destroying squares.

Cotton Variety Studies on Hill Land College Station, 1919.

Table 3 gives results from variety studies on hill land. The land used in this test was thin hill land that had been in cotton for four years. No fertilizer was used. Rainfall was rather heavy, and boll weevils did much damage. Low yields were to be expected from cotton grown under such conditions. The test is of some value in that it shows the type of varieties that do best when grown under such conditions. The big boll varieties, as in most other years, are the ranking varieties and are undoubtedly the best for this type of soil.

TABLE No. 3.—VARIETY STUDIES ON HILL LAND, COLLEGE STATION, 1919.

VARIETY	Yield per Plat.	Pounds of seed cotton per acre.	Lint per cent.	Pounds of lint per acre.	Length of staple in inches.	Value of lint per pound in cents.	Value of lint.	Value of seed at $75.00 a ton.	Total money value.	Rank in Money Value.
Simpkins	12.87	268.1	33.2	89.0	7/8	41	36.49	6.72	43.21	9
Trice (Ark. Sta.)	12.12	252.5	30.0	75.7	15/16	41½	31.42	6.63	38.05	12
Vandiver's Heavy Fruiter	9.75	203.1	32.2	65.4	1	42	27.47	5.16	32.63	13
Half & Half	9.50	197.9	34.1	67.5	7/8	41	27.67	4.89	32.56	14
Cook–588	12.25	255.2	36.5	93.1	3/4	40	37.24	6.08	43.32	8
Wannamaker–Cleveland	12.12	252.5	35.5	89.6	7/8	41	36.74	6.11	42.85	10
Cleveland–37W–54	16.75	348.9	35.0	122.1	7/8	41	50.06	8.51	58.57	4
Cleveland Big Boll	16.37	341.0	33.3	113.6	15/6	41½	47.14	8.53	55.67	5
Mexican Big Boll	18.37	382.7	31.5	120.6	1	42	50.65	9.83	60.48	2
Miller	17.37	361.8	33.1	119.8	1 1/16	45	53.91	9.08	62.99	1
Triumph	10.50	218.7	37.2	81.4	1 1/16	45	36.63	5.15	41.78	11
Lone Star–15	12.75	265.6	38.1	101.2	1 1/16	45	45.54	6.17	51.71	7
Express–432	12.87	268.1	33.7	90.3	1 1/8	50	45.15	6.67	51.82	6
Express–350	14.50	302.0	28.3	85.5	1 3/16	60	51.30	8.12	59.42	3

Study of Wilt Resistant Varieties, College Station, 1919.

Table 4 shows the yields and other data from the test of wilt resistant varieties conducted at the College Station in 1919. The test was made on the same land as in 1918 and conducted along the same lines. Most of the varieties used were standard resistant varieties; Trice, Express-432, and Wannamaker-Cleveland are susceptible varieties that were used as checks. The leader, Express-350-64, is a new strain of Express that was selected for wilt resistance. If this new strain, which now shows some promise, proves valuable, seed will be distributed as soon as available in quantity.

TABLE 4.—STUDY OF WILT RESISTANCE, COLLEGE STATION, 1919.

VARIETY	Pounds of seed cotton per plat.	Pounds of seed cotton per acre.	Lint per cent.	Pounds of lint per acre.	Length of lint.	Value of lint per pound in cents.	Value of seed at $75.00 a ton.	Value of lint.	Total money value.	Rank in money value.
Tri-Cook	22.50	703.1	34.3	241.2	15/16	41½	17.32	100.10	117.42	7
Cook-1110	20.75	648.4	39.4	255.5	7/8	41	14.73	104.75	119.48	5
Wannamaker-Cleveland	20.75	648.4	34.6	224.3	7/8	41	15.90	91.96	107.86	10
Council-Toole	26.50	828.1	31.7	262.5	15/16	41½	21.21	108.94	130.15	2
Express-432	22.00	687.5	31.0	213.1	1 1/8	50	17.79	106.55	124.34	3
Dix-Afifi	19.75	617.2	26.0	160.5	1 3/16	60	17.13	96.30	113.43	8
Express-350-64	27.25	851.5	26.9	229.0	1 1/8*	55	23.34	125.95	149.29	1
Cleveland x Cov. Toole	25.00	781.2	30.2	235.9	15/16	41½	20.45	97.90	118.35	6
Lewis-63	25.75	804.7	29.6	238.2	15/16	41½	21.24	98.85	120.09	4
Improved Dixie	12.75	398.4	34.1	135.8	7/8	41	9.85	55.68	65.63	13
Express x Cov.-Toole	21.75	679.7	30.6	208.0	1 1/16	45	17.69	93.60	111.29	9
Covington-Toole	16.00	500.0	32.4	162.0	15/16	41½	12.68	67.23	79.91	12
Trice (Ark. Sta.)	22.75	710.9	28.4	201.9	15/16	41½	19.09	83.79	102.88	11

*full.

Selection Pays.

A strain of cotton cannot be kept at the apex of its yielding capacity unless new selections are made frequently and propagation made from the choice plants selected. Unselected strains tend to deteriorate due to the mixing of seed at gins, to the crossing of different varieties in the field by means of insects, and to the appearance of sports, reversions, and other undesirable forms among the good plants. No variety of cotton is purebred in the sense that pedigreed stock is purebred. There is hybridism in its ancestry not far back, and on account of this some hybrid forms are sure to appear in all fields. When these forms have a chance to multiply and cross with the better plants, there is sure to be deterioration. The Experiment Station does considerable selection work each year, and the gains made are well shown in the variety test results the past season. In the College Station test, nine of the ten ranking varieties were station selections; in the Delta Station test, nine of the ten ranking varieties were station selections; and in the Holly Springs Station test with only seven selections in the test, three of the ten ranking varieties were station selections. The station selections did not make as good a showing in the Holly Springs test as in the others, probably on account of the fact that the selections were made to meet boll weevil conditions while the crop at Holly Springs was grown without weevils. The plants there had a long growing period.

Preliminary Studies on the Oil Content of Cotton Seed.

It has been the commonly accepted notion for some years that seed from cotton grown in the Delta has a higher oil content than seed from cotton grown in the Hill part of the State. Analyses of miscellaneous samples of seed collected in the Delta usually show a higher oil content than similar samples collected in the Hills. On the basis of these analyses and on the basis of practical results obtained by milling seed from the two sections, oil mills have paid a premium for Delta grown seed amounting to several dollars a ton.

Recent analyses made by Dr. Hand, of the Department of Chemistry, of Mississippi Agricultural and Mechanical College, have shown a variation of more than twelve gallons per ton in the oil content of seed from different varieties grown on the same plot of ground at the College Station. There probably is some difference due to the soil on which the plants were grown, but we are inclined to believe that the differences are small in comparison with the difference in content of different varieties when grown on the same land. Some experiments now being made by Dr. Hand and the writer will probably give additional information on this subject.

Professor Rast, of the University of Georgia, has made a careful study of the oil content of the seed of different varieties of cotton grown in Georgia. He also has found that there is a wide range in oil content of different varieties grown in one field.

TABLE 5—OIL AND PROTEIN CONTENT OF SEED OF VARIETIES OF COTTON, GROWN COLLEGE STATION 1917.

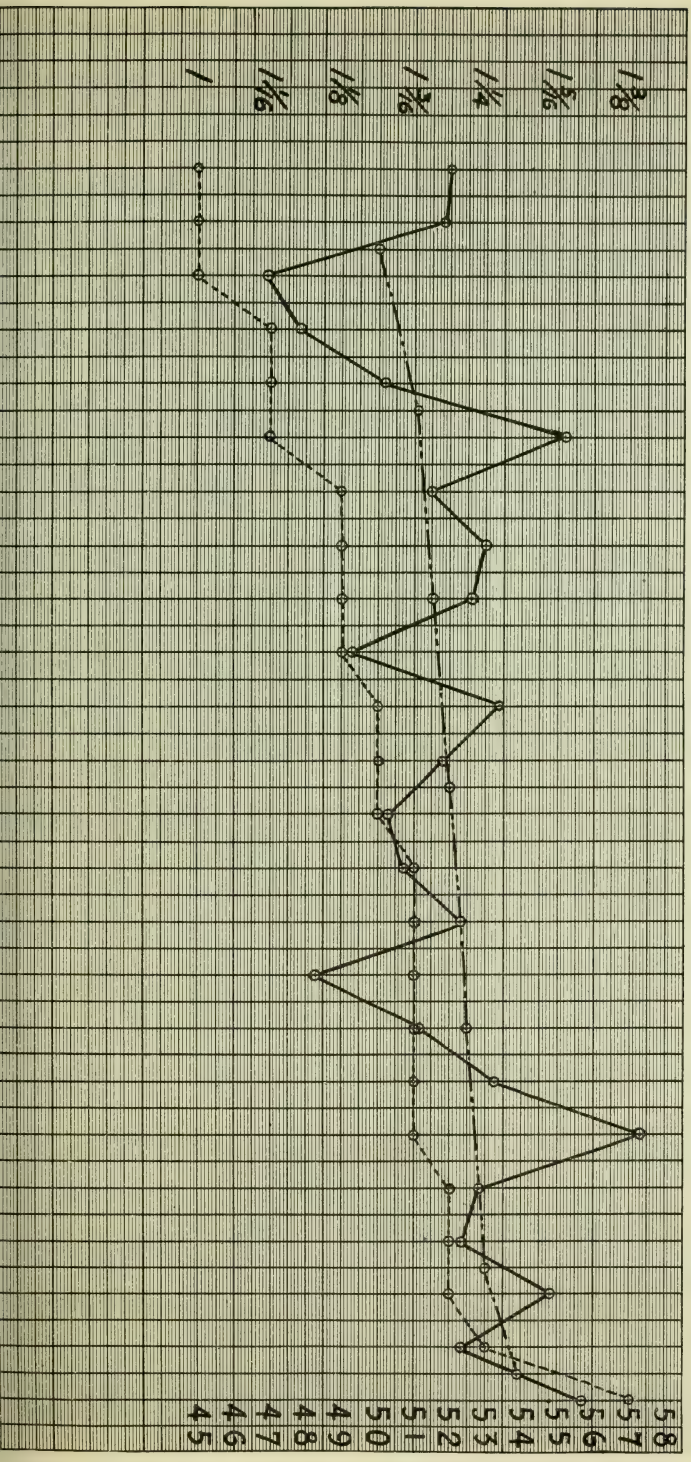
VARIETY	Per cent of meats or kernels.	Per cent of hulls.	Per cent of moisture in seed.	Per cent of oil in meats	Per cent of oil in seed.	Total gallons oil per ton.	Per cent of ammonia in meats.	Per cent of ammonia in seed.	Available oil per ton in clean seed. (gallons.)	Pounds of cake per ton from clean seed.	Pounds of hulls and linters per ton from clean seed.	Length of lint.	Per cent of lint.
Dodd's Prolific	59.06	40.94	7.89	35.19	20.78	55.40	6.68	3.95	47.98	1128.52	511.63	1 1/16	30.4
Trice 271–43	55.50	44.50	7.45	34.00	18.87	50.31	6.64	3.69	42.45	1054.23	627.40	1 1/16	29.0
Trice 270–41	57.00	43.00	7.79	33.90	19.32	51.51	6.85	3.90	43.20	1114.23	561.77	1 1/8	30.6
Wannamaker Cleveland	51.74	48.26	7.94	33.91	17.55	46.79	6.98	3.61	39.10	1031.38	675.37	1	35.6
Cleveland Big Boll	54.64	45.36	7.92	32.80	17.92	47.77	7.25	3.96	39.33	1130.37	573.65	1 1/16	33.2
Cleveland 641	56.50	43.50	7.21	34.29	19.37	51.64	6.99	3.95	43.22	1128.52	547.33	1	34.3
Cleveland 43	56.73	43.27	8.16	35.14	19.93	53.13	6.71	3.81	45.00	1089.50	572.86	1 1/8	32.6
Cook 919	55.74	44.26	7.67	35.06	19.54	52.09	6.72	3.75	44.10	1071.38	597.87	1	38.4
Miller	53.31	46.69	7.26	31.91	17.01	45.35	6.93	3.69	37.49	1054.23	664.58	1 1/8	33.4
Rowden	55.50	44.50	6.91	35.43	19.66	52.41	6.54	3.63	44.67	1037.09	627.88	1 1/8	33.4
Lone Star 15	54.50	45.50	7.83	33.93	18.49	49.29	7.19	3.92	40.94	1119.94	573.01	1 1/8	35.8
Lone Star 132	57.50	42.50	7.78	34.90	20.07	53.51	6.69	3.85	45.30	1099.95	560.30	1 1/8	28.4
Lone Star x Express	54.00	46.00	7.57	36.06	19.47	51.91	6.25	3.38	44.71	965.67	699.00	1 1/8	31.5
Express 412	53.60	46.40	7.99	33.81	18.12	48.31	6.89	3.69	40.45	1054.23	642.39	1 3/16	28.3
Express 122–433	56.00	44.00	7.39	35.11	19.66	52.41	6.71	3.75	44.42	1071.38	595.47	1 3/16	28.9
Express 314	55.50	44.50	7.74	34.04	18.89	50.36	6.83	3.79	42.28	1082.80	600.10	*1 1/8	29.0
Express 432	55.66	44.34	7.70	34.19	19.03	50.73	6.62	3.68	42.89	1051.38	626.94	1 3/16	31.7
Express 350	57.50	42.50	7.30	33.84	19.46	51.88	6.81	3.92	43.53	1119.94	553.58	1 3/16	28.0
Polk	59.17	40.83	7.75	36.63	21.67	57.77	6.07	3.59	50.12	1025.66	598.44	1 3/16	29.4
Kekchi	55.00	45.00	6.76	36.07	19.84	52.89	6.84	3.76	44.88	1074.23	589.17	*1 3/16	31.8
Foster 120	55.80	44.20	7.52	35.02	19.54	52.09	6.61	3.69	44.23	1054.23	614.04	1 3/16	30.9
Foster 120–449	57.50	42.50	7.67	34.69	19.95	53.19	6.88	3.96	44.75	1131.37	533.00	1 3/11	31.7
Columbia (U. S. D. A.)	56.00	44.00	6.89	34.94	19.57	52.17	6.69	3.75	44.19	1071.38	597.19	1 1/4	28.1
Columbia (Sherard's)	57.50	42.50	7.56	35.84	20.61	54.95	6.28	3.61	47.26	1031.38	614.17	*1 3/16	28.2
Sunflower	58.00	42.00	7.38	36.04	20.90	55.72	6.46	3.75	47.73	1071.38	570.64	1 3/8	28.0

*full.

Table 5 gives the moisture, oil, and protein content of the seed of twenty-five different strains of cotton grown at the College Station in 1917. The seed of Polk ranked highest in oil content and that of Miller lowest. Polk is a variety with small seed, low lint per cent, long staple, and rather small bolls, while Miller on the other hand, has large seeds, medium high lint per cent, medium length lint, and large bolls. It seems that, in general, varieties having the characteristics of Polk tend to have high oil content, while the shorter big boll cottons with higher lint per cent tend to have low oil content. There are certain more or less marked exceptions to the general rule as, for instance, Cook 199 and Dodds' Prolific, but even these varieties are in accord with the rule in certain respects. They both have small seeds, and Dodds' Prolific has rather low lint per cent in addition.

Figure 1 contains curves showing the relation of oil content of cotton seed and length of staple. The varieties are arranged in order of length of staple, the shortest being placed first. The two curves both rise and follow the same general course showing that as the length of staple increases the oil content of seeds does also, there being a positive correlation. Probably the analyses of samples of seed collected in the Delta have usually shown a higher oil content on account of the fact that most of the cotton grown there has been long staple cotton. Delta samples did not show as high an oil content in 1919. This condition was doubtless due to the fact that only a small per cent of the crop planted in the Delta in 1919 was long staple cotton.

Figure 2 contains curves showing the relation of oil content of seed and lint per cent. The varieties are arranged in order of lint per cent, starting with the lowest. It will be seen that the two curves run in different directions; as the lint per cent curve rises, the oil content curve falls, indicating in general a negative correlation, or that with the increase in lint per cent there is a decrease in oil content of seeds.



1. Curves showing relation of length of lint and oil content of cotton seed.
length, dotted line - - - - - - - - - - .
ons oil per ton, solid line ——————————.
othed curve for oil content, dots and dashes - - —— - - —— - - ——.

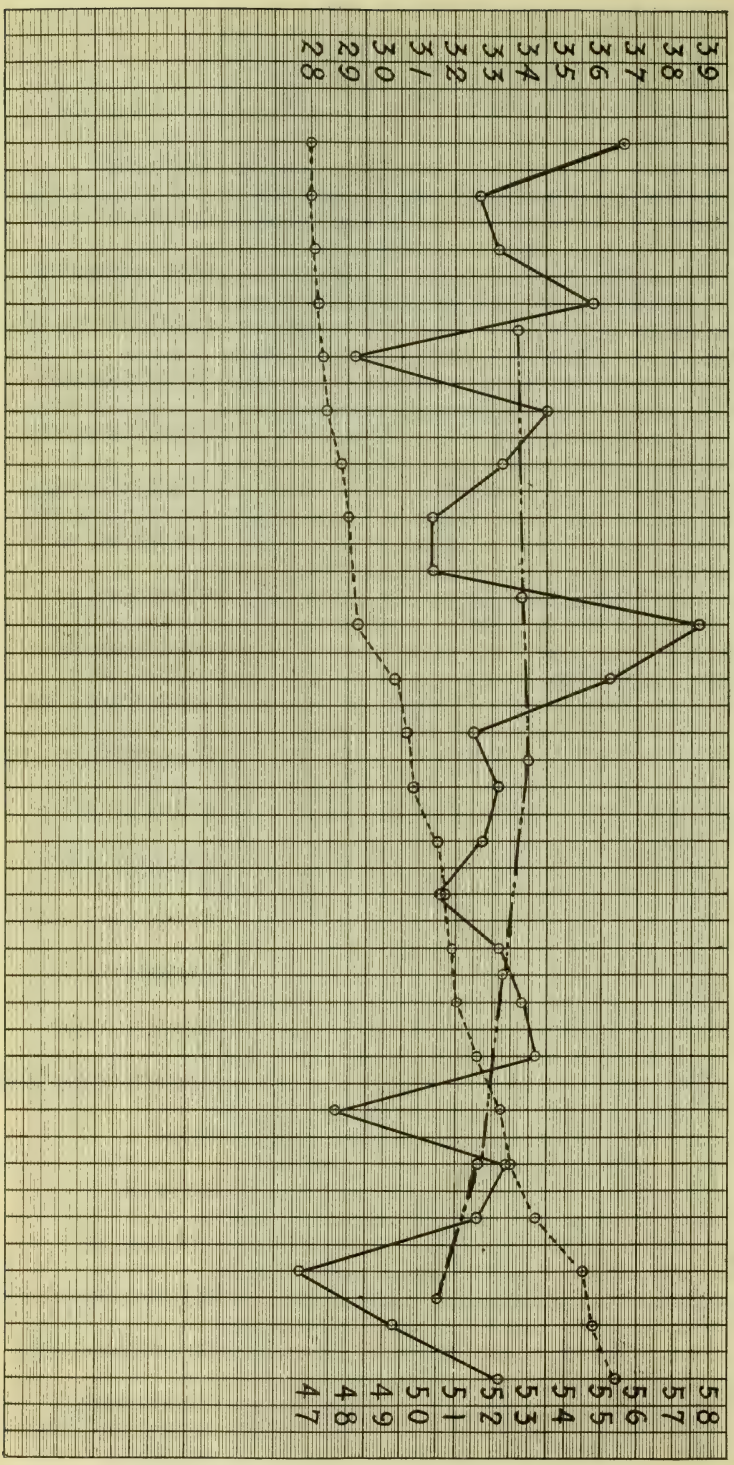
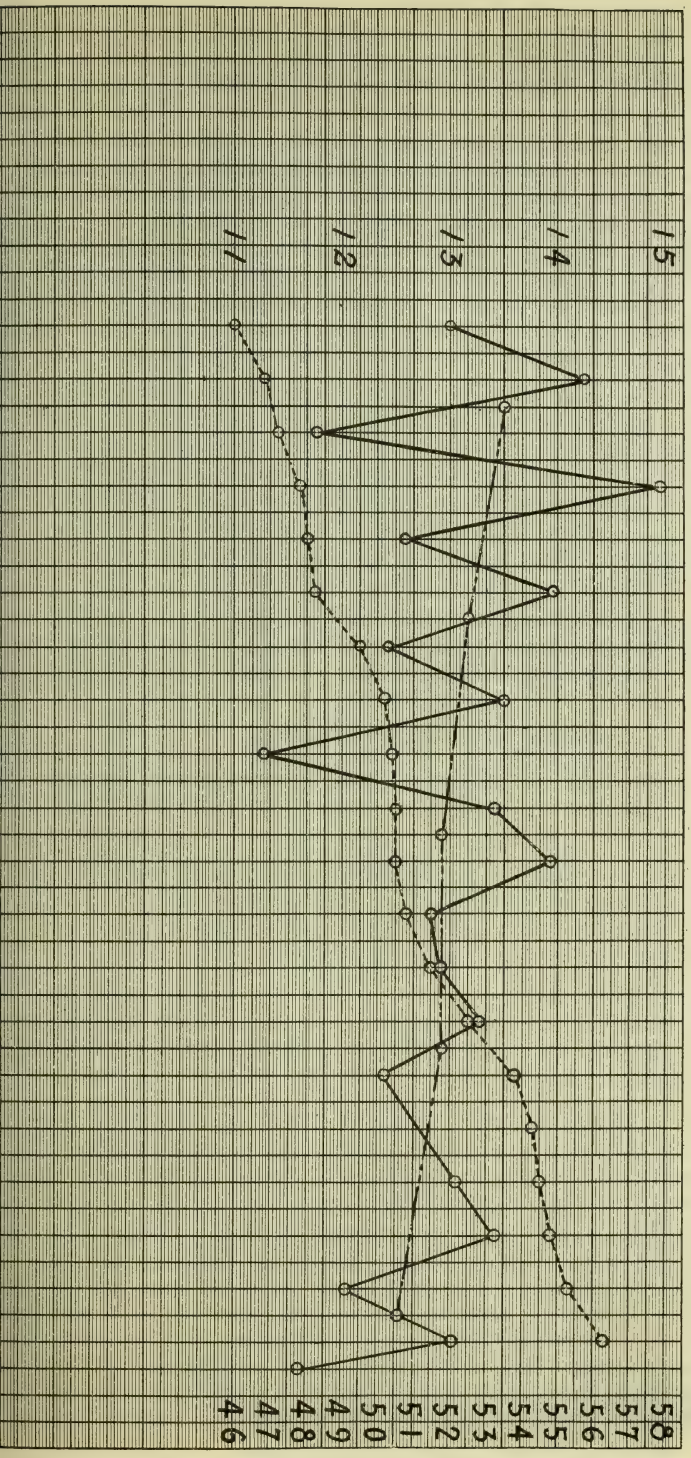


Fig. 2. Curves showing relation of lint per cent. and oil content of cotton seed.
Lint per cent, dotted line - - - - - - - .
Gallons oil per ton, solid line ———————.
Smoothed curve for oil content, dots and dashes - - - —— - - —— - - ——.



3. Curves showing relation of size of cotton seed and oil content. ght of 100 seed in grams, dotted line - - - - - - - - - - ons oil per ton, solid line ——— othed curve for oil content, dots and dashes - - ——— - - ——— - - ———.

Figure 3 contains curves showing the relation of oil content and size of seed. The weight of one hundred seed was taken as the basis for size. (The smaller seeds were probably heavier than the larger seeds, bulk for bulk, but the seeds with greatest volume totaled the greatest weight and were, therefore, the largest both in volume and in weight.) The varieties are arranged in order of size of seed, starting with the smallest. The two curves in this figure also run in different directions; in general, as the size of the seed increases, the oil content falls. Wannamaker-Cleveland is a rather marked exception to the general rule. The seeds of this variety are rather small, but the oil content is very low.

Figure 4 contains curves showing relation of nitrogen and oil content of cotton seed. The different varieties are arranged in order of rank in ammonia content of seeds, starting with the lowest. The two curves in this case also show negative correlation. In general, as the ammonia content increases, the oil content falls. Polk, the lowest in ammonia, is the highest in oil. Kekchi seems to be an exception. It ranks medium high in ammonia content and is one of the highest in oil content. Some of these exceptions are probably due to varietal peculiarities, but others may be due to experimental error.

It appears from these preliminary studies of the oil content of seed of different varieties of cotton that the variety of cotton should be considered when seed are graded or bought and sold, rather than the locality where seed was grown.

DESCRIPTION OF VARIETIES.

Below is a brief description of the principal varieties grown in the tests the past season. The descriptions in most cases are based on several years' observation.

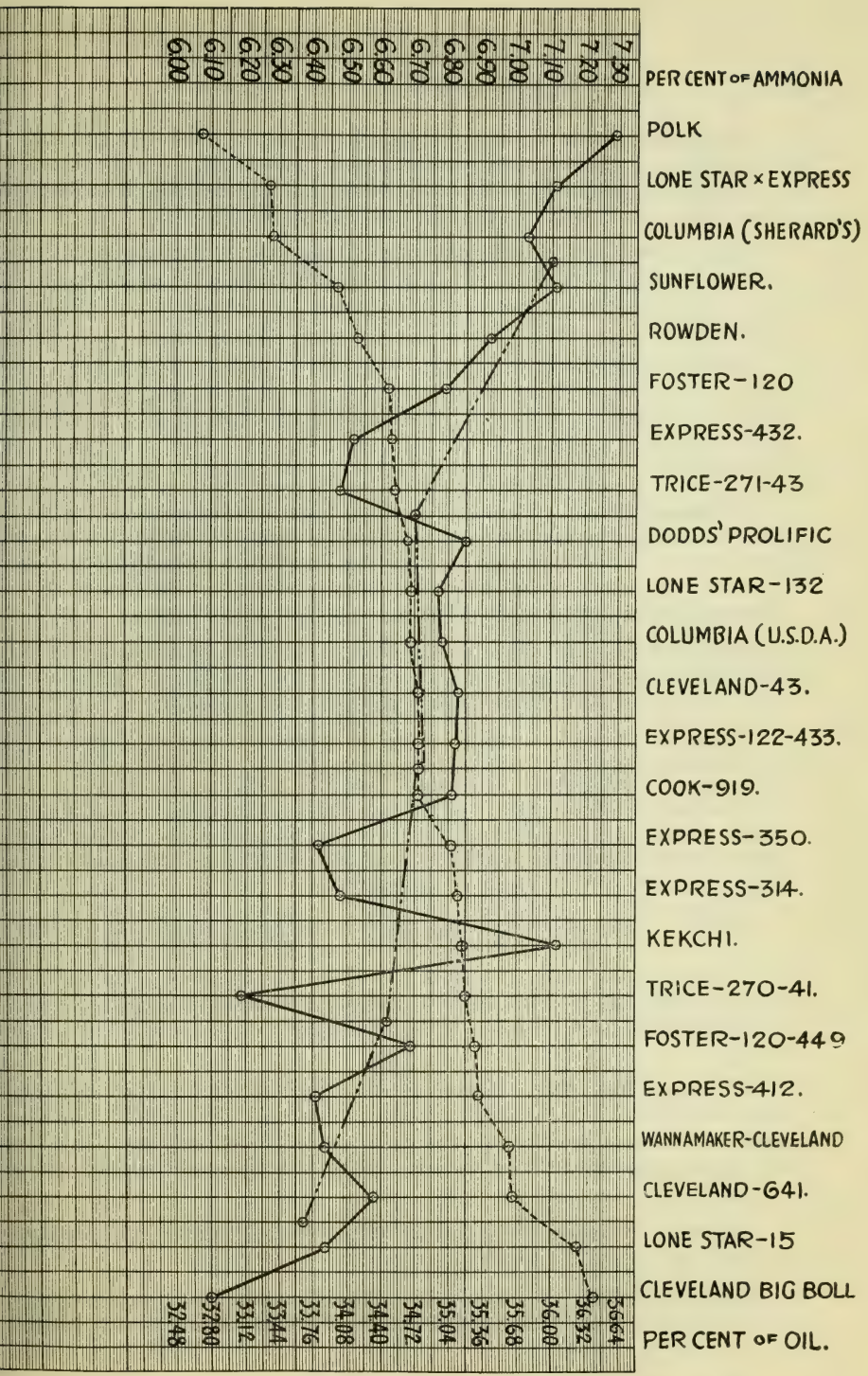
Simpkins. King type; extra early and prolific; plants, small, slender, open, and foliage light. Bolls small, 80 to a pound; bolls open well and are medium stormproof; 31 to 33% lint; staple 3-4 to 7-8 inches; very susceptible to cotton wilt; not a suitable variety for planting on thin hill land.

Trice. Plants small to medium sized, very early and prolific, foliage light; bolls medium sized, 64 to a pound, open well, and medium stormproof; 30 to 32% lint; staple 1 to 1 1-16 inches; plants very susceptible to cotton wilt; not suitable for planting on sandy, thin, or hill land.

Trice-270-41. Differs from the original strain of Trice in having slightly more compact plants, smaller bolls, 70 to 75 per pound; and longer staple, 1 1-16 inch or better. This strain is very early and a good yielder; adapted to rich lands that are free from wilt; selected by Mississippi Experiment Station.

Vandiver's Heavy Fruiter. Semi-clustered type, medium late, not prolific; plants rather stocky with heavy foliage; bolls medium large, 58 to 60 to a pound, open well; 31 to 33% lint; staple 1 to 1 1-16 inch. Probably best adapted to hill land.

Lewis' Prize. Plants compact, and of medium height; leaves small but numerous; medium early and rather prolific; bolls rather small and blunt pointed; about 80 to a pound; 32 to 34% lint; staple 1 inch.



. Curves showing relation of nitrogen and oil content of cotton seed meats.
ent of ammonia in meats, dotted line - - - - - - -
ent of oil in meats, solid line ———.
hed curve for oil content, dots and dashes - - —— - - —— - ——.

Cook-588. Plants medium height, foliage medium heavy; medium early and prolific; bolls rather large, ovate and blunt pointed, 58 to 60 to a pound; 36 to 38% lint; staple 7-8 inch. Moderately wilt resistant but susceptible to anthracnose. Originated by the Alabama Experiment Station.

Cook-1010. This strain differs from Cook-588 in having small bolls, 66 to 70 per pound, higher lint per cent (40 to 42), and shorter staple)3-4 inch). It is very prolific and a good yielder; originated by the Alabama Experiment Station.

Wannamaker-Cleveland. Plants medium height with medium heavy foliage; mostly with 3 or 4 vegetative branches; medium early and prolific; bolls rounded, with very blunt tip, 60 to 62 to a pound; 35 to 37% lint; 7-8 to 1 inch staple; semi-resistant to wilt and anthracnose; adapted to both hill and Delta regions.

Cleveland-37W-54. Plants of medium height, rather compact; medium early and fairly prolific; bolls rounded, blunt pointed; 62 to 64 to a pound; 35 to 36% lint; 7-8 to 1 inch staple; somewhat resistant to wilt and anthracnose; adapted to hill land and soils somewhat wilty. This is a selection from Wannamaker-Cleveland made by the Mississippi Experiment Station.

Cleveland Big Boll. Plants slightly taller than Wannamaker-Cleveland, and medium leafy; medium early and medium prolific; bolls rather large, ovate, and blunt pointed; 54 to 56 to a pound; 33 to 35% lint; 1 inch staple.

Cleveland (Smith's). Plants similar to those of Wannamaker-Cleveland; slightly more prolific but with lower lint per cent.

Mexican Big Boll. Plants of medium height, and medium light foliage; slightly earlier and more prolific than Wannamaker-Cleveland; bolls medium sized, 60 to 65 to a pound, ovate, blunted; 31 to 33% lint; 1 inch staple; fairly disease resistant and apparently a good hill land cotton.

Miller. Plants of medium height, and rather heavy foliage; medium early but not quite as early as Wannamaker-Cleveland; not prolific; bolls large, 45 to 50 to a pound, ovate with blunt tip; 33 to 35% lint; 1 1-16 inch staple; is somewhat resistant to wilt but rather susceptible to anthracnose; best adapted to hill land; originated by A. D. Miller, Blue Springs, Miss.; is a selection from Rowden.

Triumph (Mebane's). Plants rather low and stout, with heavy foliage; medium early but considerably later than Cleveland; not prolific; bolls very large, 42 to 48 to a pound, ovate and blunt pointed; 35 to 38% lint; 1 to 1 1-16 inch staple; somewhat resistant to wilt; a good hill land cotton where boll weevils are not numerous.

Triumph (Ferguson's). General characteristics similar to Mebane's Triumph but has slightly lower lint per cent and shorter staple.

Lone Star-132-48. Plants of medium height and somewhat slender; foliage, rather light with edges of leaves raised, commonly, so as to make the leaf concave

above; rather early and prolific for a big boll cotton; bolls rather large, 58 to 62 to a pound, elongated, ovate, and blunt pointed; 30 to 32% lint; 1 1-8 inch staple; susceptible to wilt and anthracnose; adapted to rich land that is free from wilt; originated by the Mississippi Experiment Station.

Polk. Plants tall and slender, foliage light; early but not quite as early as Express; very prolific with mostly short fruit branches; bolls rather small, 80 to 84 to a pound, narrowly ovate and sharp pointed; 28 to 30% lint; 1 3-16 inch staple; somewhat resistant to wilt and anthracnose; adapted to Delta lands; is more resistant to disease and has a better character of staple than Express but is not so good a yielder. Tradition has it that it originated as a chance seedling in a negro's yard near Clarksdale, Mississippi, about 1910.

Magnolia. Plants medium tall and somewhat spreading, foliage light; very early and prolific; bolls rather small, 70 to 75 to a pound, narrowly ovate and sharp pointed; 26 to 28% lint; 1 1-8 to 1 3-16 inch staple; but slightly resistant to wilt; adapted to Delta lands. Originated by J. B. Allen, of Port Gibson, Mississippi.

Express-350. Plants medium tall, rather spreading, with light foliage; very early and very prolific; bolls medium small, 72 to 76 to a pound, narrowly ovate, and sharp pointed; 27 to 29% lint; 1 1-8 to 1 3-16 inch staple; rather susceptible to wilt and anthracnose; adapted to Delta and valley lands. Originated by the Mississippi Experiment Station.

Express-122-433. Similar to Express-350 except that plants are somewhat smaller and more compact; bolls are more storm resistant but harder to pick, and plants are more disease resistant.

Express-432. Differs from Express-350 in having larger and more spreading plants; higher lint per cent (31 to 33); shorter staple (1 1-8 inch); and more disease resistance; plants are probably also better adapted to withstand dry weather conditions, but are not quite as early.

Foster-120. Plants rather low with medium slender stems and rather light foliage; early and prolific but not quite as early as Express-350; bolls rather large, 56 to 62 to a pound, pyriform and long taper pointed; 30 to 32% lint 1 3-16 to 1 1-4 inch staple; rather susceptible to wilt and anthracnose; well adapted to rich lands that are free from wilt; originated by the Mississippi Experiment Station; selection from Foster; plants are earlier and smaller than those of the original strain.

Foster-120-6102. A selection from Foster-120, which differs from it in having earlier and more prolific plants, slightly smaller bolls, and shorter staple (1 1-8 inch). Originated by the Mississippi Experiment Station.

Foster-11. A Foster selection resembling Foster-120 but differing from it in having larger plants, slightly longer staple, slightly lower lint per cent, and in being somewhat later. If the fruiting season is moderately long, this strain will outyield Foster-120.

Webber-49. Plants rather low and medium stocky; foliage rather heavy; medium early and rather prolific; bolls rather large, 64 to 68 to a pound, ovate, and medium pointed; lint per cent 29 to 31; 1 3-16 to 1 1-4 inch staple; somewhat susceptible to wilt and anthracnose; adapted to Delta and valley lands.

Columbia (Sherard's). Plants rather tall and spreading; foliage heavy; medium late; rather prolific; bolls rather large, 66 to 70 to a pound, broadly ovate and sharp pointed; 28 to 30% lint; 1 3-16 to 1 1-4 inch staple; somewhat resistant to wilt but rather susceptible to anthracnose or pink boll rot; adapted to medium fertile lands where weevils are not numerous.

Sunflower. Plants tall and spreading with medium foliage; rather late but, perhaps, a little earlier than most of the old long staple varieties; moderately prolific; bolls rather small, 80 to 85 to a pound, somewhat blunt pointed; 26 to 28% lint; 1 1-4 to 1 5-16 inch staple; rather resistant to diseases; a good long staple cotton for Delta and valley lands where boll weevils are not troublesome.

Allen's Long Staple. Similar to Sunflower in general characteristics; is probably somewhat later, less prolific, and has a slightly lower lint per cent, but has slightly longer staple.

Mississippi Silk. Very similar to Allen's Long Staple in all respects.

Meade. Plants of medium height, medium stout, and with medium foliage; begins blooming rather early and blooms right freely but does not seem to be very prolific in respect to the production of mature bolls. Bolls appear large, but the mass of seed cotton inside is rather small (68 to 72 to a pound), ovate, and long pointed; 23 to 26% lint; 1 5-16 to 1 1-2 inch staple; somewhat susceptible to wilt and anthracnose. This variety was introduced by the United States Department of Agriculture to be used as a substitute for Sea Island cotton when that variety could no longer be grown profitably. Its bolls open like Sea Island bolls, but its lint and seed characters are similar to those of upland varieties. This variety does not appear to be adapted to Mississippi conditions.

SOURCE OF SEED.

Below is a list of the sources from which seed of the varieties tested in 1919 was obtained:

Allen's Long Staple	J. B. Allen, Port Gibson, Mississippi
Boykin	Ferguson Seed Farms, Sherman, Texas
Cleveland–43	Mississippi Experiment Station
Cleveland (Wannamaker)	W. W. Wannamaker Seed Co., St. Mathews, S. C.
Cleveland Big Boll	J. R. Cleveland, Decatur, Mississippi
Cleveland Covington–Toole	Mississippi Experiment Station
Cleveland 37 W–54	Mississippi Experiment Station
Cleveland (Smith's)	Piedmont Seed Farm, Commerce, Georgia
Cook 588	Alabama Experiment, Auburn, Alabama
Cook 1110	Alabama Experiment Station, Auburn, Alabama
Cook 1010	Alabama Experiment Station, Auburn, Alabama
Columbia	J. H. Sherard, Sherard, Mississippi.
Council–Toole	State Board of Entomology, Atlanta, Georgia
Covington–Toole	J. E. Barr, Clio, Alabama
Cook 307–6	Alabama Experiment Station, Auburn, Alabama
Dixie Improved	State Board of Entomology, Atlanta, Georgia
Dix Afifi	State Board of Entomology, Atlanta, Georgia
Express 432	Mississippi Experiment Station
Express 350	Mississippi Experiment Station
Express 122–433	Mississippi Experiment Station
Express 350–64	Mississippi Experiment Station
Express 350–630	Mississippi Experiment Station
Foster 120	Mississippi Experiment Station
Foster 11	Mississippi Experiment Station
Foster 120–64	Mississippi Experiment Station
Foster 120–6102	Mississippi Experiment Station
Foster 120–631	Mississippi Experiment Station
Foster 120–698	Mississippi Experiment Station
Foster 120–66	Mississippi Experiment Station
Half & Half	Willett Seed Co. Augusta, Georgia
Lewis–63	State Board of Entomology, Atlanta, Georgia
Lewis Prize	W. B. F. Lewis, Lewiston, Louisiana.
Lone Star (Ferguson)	Ferguson Seed Farms, Sherman, Texas
Lone Star 132–48–61	Mississippi Experiment Station
Lone Star 132–48	Mississippi Experiment Station
Lone Star 15	Mississippi Experiment Station
Marshall	C. K. Marshall, Greenwood, Mississippi
Meade	Bureau of Plant Industry, Washington, D. C.
Magnolia	J. B. Allen, Port Gibson, Misisssippi
Miller	A. D. Miller, Blue Springs, Mississippi
Mexican Big Boll	O. H. Bales, R. R. No. 12, Charlotte, N. C.
Mississippi Silk	Alex Scott, Rosedale, Mississippi
Sunbeam	Willett Seed Co., Augusta, Georgia
Sunflower	Marx Shaefer, Yazoo City, Mississippi
Sunflower x Express–61	Mississippi Experiment Station
Simpkins	W. A. Simpkins, Raleigh, N. C.
Tri–Cook	Alabama Experiment Station, Auburn, Alabama
Triumph	A. D. Mebane, Lockhart, Texas
Trice–270–41	Mississippi Experiment Station
Trice (Ark.)	Arkansas Experiment Station, Fayettville, Arkansas
Trice–271–43	Mississippi Experiment Station,
Triumph (Ferguson)	Ferguson Seed Farm, Sherman, Texas
Triumph (Mebanes)	A. D. Mebane, Lockhart, Texas
Vandiver's Heavy Fruiter	Vandiver Seed Co., Lavonia, Georgia
Webber–49	Coker Seed Co., Hartsville, S. C.

COTTON EXPERIMENTS, 1920

INTRODUCTION.

In 1920 rather extensive cotton experiments were carried on by the College Experiment Station and the several branch stations. Due to the high cost of printing and the scarcity of funds for publications, but brief reports covering only a part of the experiments carried on will be made at this time. This bulletin mentions only certain results from the College Station.

The Weather. During March and April, the temperature was below normal and rainfall excessive; 22.67 inches of rain fell; this was 12.05 inches above normal. May was warmer, but the rainfall continued excessive. The weather the rest of the year was fairly seasonable. Killing frosts did not occur until the middle of November.

Boll Weevils. Weevils were found on the College farm June 17. Following this many came out of hibernation, producing a heavy initial infestation. They increased much more rapidly in some fields than in others, but on the whole damage was great. By the last of July weevils were numerous enough to destroy all forms, and much injury was done prior to this date. In the east central part of the State weevil damage was considerably worse than in 1919. The same was true for all parts of the State. In the southern part the crop was almost ruined; in the Delta, damaged considerably in places; in the northern part there was little or no injury.

Classing. The stapling and classing was done by C. W. Willis, Government cotton grader, stationed at Pontotoc, Mississippi. The staple lengths given are based on commercial standards and are somewhat longer comparatively than others published the last two years. The prices used are based on the New Orleans market for November 29, white cotton, of good character and strict middling grade. The John M. Parker Cotton Company, of New Orleans, kindly quoted us market prices for the various staple lengths.

Variety Studies.

The cotton in the main variety test was planted April 24, on Houston clay valley soil of moderate fertility. Rains following planting favored germination, and an excellent stand was secured of all varieties except Triumph, Foster-120-6102, and Foster-120-631. The skips in the rows of these varieties were replanted with hoes May 5. No fertilizer was used. Boll weevils appeared in the plats about the middle of June. The weather favored their multiplication, and much injury resulted. No control measures were used. Rust and fungus diseases did practically no damage.

Table No. 6 shows the comparative yields of different varieties in the test. The yields are rather low in all cases. Foster-120-6102, Trice-270-41, and Smith's Cleveland led in yield of seed cotton per acre, but the differences in lint per cent and length of staple made some other varieties rank higher in money value.

TABLE 6.—COTTON VARIETY TEST, COLLEGE STATION, 1920.

VARIETY	Plat yield of seed cotton.	Plat yield for perfect stand.	Yield seed cotton per acre.	Lint per cent.	Pounds lint per acre.	Length of staple in inches.	Value lint per pound in cents.	Value lint per acre.	Pounds seed per acre.	Value of seed at $25.00 a ton.	Total money Value.	Rank in money value.	Weight of 100 bolls in ounces.
Simpkins Ideal	86.5	87.4	874	33.2	290	1	16¼	47.12	584	7.30	54.42	20	20
Trice–270–41	103.7	109.4	1094	29.4	321	1 3/16	23	73.83	773	9.66	83.49	5	22
Cleveland–Wannamaker	74.0	92.7	927	35.3	327	1 1/16	17	55.59	600	7.50	63.09	15	27
Cleveland (Coker)	91.5	92.9	929	35.2	327	1 1/16	17	55.59	602	7.52	63.11	14	25
Cleveland–37W–54	92.0	97.4	974	33.4	325	1 1/16	17	55.25	649	8.11	63.36	13	26
Cleveland Big Boll	83.2	87.4	874	33.1	289	1 1/16	17	49.13	585	7.31	56.44	19	29
Cleveland (Smiths)	101.0	102.7	1027	33.2	341	1	16¼	55.41	686	8.57	63.98	11	26
Cook–1010	99.0	100.8	1008	36.3	366	1	16¼	59.47	642	8.02	67.49	10	24
Mexican Big Boll	80.0	83.5	835	37.9	316	1 1/16	17	53.72	519	6.49	60.21	16	26
Miller	85.5	86.0	860	31.6	271	1 1/8	19	51.49	589	7.36	59.12	17	32
Triumph	64.0	74.7	747	35.6	266	1 1/8	19	50.54	481	6.01	56.55	18	33
Lone Star–132–48	93.0	93.6	936	32.4	303	1 3/16	23	63.69	633	7.91	71.60	8	26
Acala No.5	80.7	84.3	843	35.4	298	1 1/8	19	56.62	545	6.81	63.43	12	26
Express–432	88.5	89.7	897	30.6	274	1 3/16	23	63.02	623	7.79	70.81	9	22
Express–122–433	95.5	97.5	975	27.8	271	1 1/4	27	73.17	704	8.80	81.97	6	22
Foster–120–6102	104.0	108.5	1085	30.7	333	1 3/16	23	76.59	752	9.40	85.99	2	20
Foster–120–631	86.0	99.5	995	30.5	303	1 5/16	32.5	98.47	692	8.65	107.12	1	24
Webber–49–3	57.2	63.9	639	29.0	185	1 3/8	37.5	69.37	454	5.67	75.04	7	22
Columbia	81.0	82.7	827	28.4	235	1 5/16	32.5	76.37	592	7.40	83.77	4	21
Hartsville–12	72.5	74.0	740	28.3	209	1 3/8	37.5	78.37	531	6.64	85.01	3	31
Hartsville–14	40.0	41.8	418	25.7	107	1 3/8	37.5	40.12	311	3.89	44.01	21	30

In the hill land variety test, Miller and Cleveland Big Boll made the best yields. Cleveland-37W-54 made the best yield in the test conducted on soil infected with cotton wilt or blight.

CULTURAL METHODS FOR EAST AND CENTRAL MISSISSIPPI.

Preparation of Seed Bed. The character of the soil very largely determines the time of breaking. A stiff soil should be plowed in the fall or winter and left rough for the action of the freezes. If the soil is light, plowing may be deferred until a few weeks before planting. It is necessary to plow late if the soil has a tendency to wash badly. On level lands the plowing can be done in the fall or early winter, the earlier the better, so that the vegetable matter may be more nearly decomposed by spring.

The method of plowing is determined in large part by time and team power. Flat breaking or broad casting the land to a depth of eight to ten inches and then ridging it with a middle burster in the spring gives the best seed bed. Planting on a low ridge or bed is better for cotton than planting flat, since the land dries out and warms up earlier, the seed germinate better, and the first cultivation can be made without damaging the young plants. Throwing two furrow slices together with a turning plow and using a middle burster to split the balks is a common practice, which is all right if done early and the ridges freshened at planting time with a harrow. Another method that is followed to a considerable extent in places is to split the old beds or ridges of the preceding year with a 4-mule middle burster. This covers most of the vegetable matter which decays by spring. Just before planting, the ridges made by the buster are freshened with a disc harrow and smoothed with a drag harrow or drag. This method is speedy, but more work is required to cultivate the following crop than where flat breaking is practiced. In all cases the bed should be made some time before planting so that it will have a chance to become firmed or packed.

Planting. Cotton should be planted as early in the spring as weather conditions will permit, but it is not advisable to plant until the soil has become warm enough to germinate the seeds readily and produce good growth in the young plants. At the College Station, the best time for planting is usually from the 15th to the 20th of April. South of the Station planting can be done a few days earlier, and north a few days later. The date of planting is also determined somewhat by the character of the soil. A well drained loam can be planted earlier than the stiffer soils. In our experimental plats we have planted earlier than the dates mentioned, but have failed to get a stand just about as many times as we have succeeded. The cold may not be severe enough to kill the young plants, but it will retard their growth to such an extent that they will not yield so well as later plantings.

Under boll weevil conditions, if a stand is not secured early in the spring, a second planting should not be made, but some other crop planted instead. To secure a stand, "plenty" of seed should be planted. The germination per cent of cotton seed is low unless temperature and moisture conditions are just right. We find it to be economy to use a bushel or more to the acre and then chop to the proper stand. With a good seed bed and the surety of proper moisture and temperature, a half-bushel per acre would be sufficient for a perfect stand; but these conditions are so uncertain, and the risk is so great that not less

than a bushel per acre is best. Cotton seed should be planted shallow. The young plants are not vigorous and cannot get out of the ground if the seed is planted very deep. A depth of one-half to one inch is usually best.

Cultivation. The first cultivation will necessarily have to be shallow to prevent covering the young plants. A spring-tooth cultivator is a good implement for this purpose. The succeeding cultivations should be as deep as possible without injury to the plants. When, however, the plants are 8 to 10 inches high, the cultivations should be shallow, but deep enough to make a good mulch. In case of continued rains, which interfere with regular cultivation, it may be necessary to destroy grass and weeds by some drastic method. The implement at hand that will do this best with the least injury to the plants is, of course, the one to use. It is a bad practice to "bar off" or to turn the soil away from the young plants. If this is necessary to destroy grass and weeds, the soil should be returned to the plants as soon as possible. Cultivation should be continued until the first of August.

Fertilizer for Cotton. On the basis of the fertilizer experiments that have been carried on at the College Station, the only fertilizers that can be recommended for cotton in this section are nitrogen and kainit. On land that has not had a heavy crop of legumes turned into it recently, the use of 100 pounds of nitrate of soda per acre, or 200 pounds of cottonseed meal, or the equivalent of readily available nitrogen in other forms of nitrogen carriers, will probably prove profitable. Cottonseed meal should be distributed in the drill before planting. Nitrate of soda may be put in the row before planting or used as a side dressing about the time cotton begins to square. On land on which cotton rusts, the use of 200 pounds of kainit per acre is advisable. The kainit should be applied in the drill before planting.

BOLL WEEVIL CONTROL.

One of the most important matters in connection with cotton production in Mississippi is that of boll weevil control. Over much of the State weevils are the chief limiting factor. The Experiment Station has carried on some experiments looking toward weevil control every year since 1914, when weevils first began to damage seriously cotton in this part of the State.

Various methods of control have been tried, such as picking adult weevils by hand, picking up punctured squares, shaking plants in a bag held open by a hoop, etc. Various types of weevil catching machines have been tried also. Many weevils were destroyed by each method, but none of them gave an effective control.

Poisoning was started in 1917. That year and also the year following, lead arsenate powder was applied to some small plats without an appreciable effect.

In 1919 calcium arsenate was used on thirty-seven different plats and fields, ranging in size from one-twentieth of an acre to six acres. On the small plats the poison proved ineffective; on the small fields profitable, gains being secured in two cases out of three.

In 1920 poisoning tests with calcium arsenate were made on four different fields of cotton on the College farm, ranging from 3 1-4 to 8 acres in size. In addition to this, poison was used on twenty-one multiplying patches and small cuts of cotton planted for various other experiments.

TEST I.

Test I was made with 3 1-2 acres of cotton growing on red clay hill land of rather low fertility. No other cotton was in close proximity. Boll weevils appeared during June but multiplied slowly. On July 12, the infestation was only a fraction over one per cent. Following this they multiplied somewhat more rapidly, reaching 14% July 26. On July 29, 6.9 pounds of poison per acre was applied with a cart type cotton dusting machine to one-half the cut. The poison was applied while heavy dew covered the plants. Following this, four other similar applications were made at intervals of a week or less. Weevil infestation increased in both poisoned and unpoisoned areas averaging about 20% more in the unpoisoned. The following table shows the main results of the test:

Yield Per Acre in Poisoned Plat—
- First picking, Sept. 24 ..... 396 lbs.
- Second picking, Oct. 20 ..... 142 lbs.
- Total ..... 538 lbs.

Yield Per Acre in Unpoisoned Plat—
- First picking, Sept. 24 ..... 414 lbs.
- Second picking, Oct. 20 ..... 58 lbs.
- Total ..... 472 lbs.

Increase due to poisoning ..... 66 lbs. per acre.
Value of increase (lint 15c, seed 1 1-4c per lb.) ..... $ 3.85 per acre.
Cost of Poisoning—
- 37 lbs. calcium arsenate (28c per lb.) ..... 10.36 per acre.

Number of applications, 6.
- Cost of labor and team ..... 1.23 per acre.
- Total cost of poisoning ..... 11.59 per acre.
- Loss due to poisoning ..... 7.74 per acre.

TEST II.

Test II was made on a field of about eight acres of black valley soil. The soil in this cut appeared uniform and the cotton also when the poisoning was done. Later rust damaged badly the cotton in parts of the field and was especially bad on the poisoned area. Four applications of poison were made about as in Test I. This reduced the infestation in the poisoned areas half or more, but the final yield was 365 lbs. per acre greater on the unpoisoned plats. The expense of poisoning was, therefore, a total loss.

TEST III.

Test III was made on 4 3-5 acres of valley loam soil of medium fertility. The cotton was not planted until late, about May first, and was damaged considerably by wet weather and grass. Probably the unpoisoned plats were damaged more than the others. Weevils appeared in June, but multiplied slowly, not reaching 13% infestation until August 2; 5 3-5 lbs. poison per acre was applied to one-half the cut on August 6. Five other applications were made at intervals from four to seven days. Rains interfered considerably by washing

off the poison and making the ground so soft that it was difficult to run the machine. After the poisoning work was started weevils increased slowly in the poisoned part of the field and about twice as rapidly in the rest, reaching maximum infestation in the unpoisoned areas about August 30.

The cost and yields for Test III were as follows:

39.5lbs. calcium arsenate per acre	$11.06
Labor per acre, team and man	1.76
Total cost of poisoning	12.82

Yield Per Acre in Poisoned Plats—

First picking	786.0 lbs.
Second picking	195.0 lbs.
Total	981.0 lbs.

Yield Per Acre in Unpoisoned Plats—

First picking	524.0 lbs.
Second picking	22.5 lbs.
Total	546.5 lbs.
Gain per acre for poison	434.5 lbs.
Value of seed and lint of increase	$21.57
Profit per acre	8.75

TEST IV.

Test IV was made on 3 1-4 acres of hill land that varied considerably in fertility in different parts but was divided so that the fertility was divided between poisoned and unpoisoned areas. This cotton was not planted until May 5, and suffered from lack of proper cultivation while young. Weevil infestation was light during July, attaining 5 1-2 per cent August 2. Six pounds per acre poison was applied August 6. Other applications were made August 13, 17, and 24. Here as in other plats, infestation increased about twice as fast in unpoisoned plats. Weevils destroyed all forms put on after August 30.

Cost and yields for Test IV were:

27.5 lbs. calcium arsenate per acre	$ 7.72
Labor per acre, team and man	1.64
Total cost of poisoning	9.36

Yield Per Acre from Poisoned Plats—

First picking	478.5 lbs.
Second picking	99.0 lbs.
Total	577.5 lbs.

Yield Per Acre from Unpoisoned Plats—

First picking	375.0 lbs.
Second picking	32.5 lbs.
Total	407.5 lbs.
Gain per acre from poison	170.0 lbs.
Value of lint and seed of increase	$ 9.96
Profit per acre	.60

As was stated above, poison was used on a number of other cuts and small fields on the College farm. On these, whole areas were poisoned, no unpoisoned parts being left; it is impossible, consequently, to say just how much effect the poison had but apparently there was considerable gain in amount of cotton produced, due to the poison. But whether there was enough to yield a net profit was somewhat doubtful. These plats were compared with a few plats on the farm that received no poison.

Rains during July and August interfered with the poisoning work considerably by washing off the poison and by making the ground too soft, at times, for the dusting machine to run. The high cost of labor and the rather high cost of poison made the work less profitable than it might be under other conditions.

From the foregoing results, and from others published by different experiment stations and by the U. S. Department of Agriculture, it will be seen that gains to be obtained from boll weevil poisoning are somewhat uncertain. Profit will not result except where certain conditions obtain. It will probably not pay to poison unless the plants are young and vigorous, the soil fertile enough to produce half a bale to the acre, and a heavy weevil infestation expected. Poison which does not conform to the government specifications should not be used. Approved types of machines for applying the poison are necessary. This work requires much care and effort and must be done regularly if good results are to be expected. A single application will likely do but little good; neither will two or more if two weeks apart.

Any one that is thinking of trying boll weevil poisoning the coming season had better write the Experiment Station, Agricultural College, Mississippi, or to the Boll Weevil Laboratory, Tallulah, Louisiana, for further information regarding the work.

TABLE SHOWING COTTON ACREAGE AND PRODUCTION IN MISSISSIPPI IN 1918 AND 1919

Table 7—Cotton Acreage and Production in Mississippi in 1918, 1919 and 1920.

The following table shows the number of acres planted in cotton in the various counties of the State in 1918, 1919, and 1920, and also the number of bales produced. The yields for 1918 and 1919 are based on ginning reports secured by the Census Bureau. The acreage for 1918 1919, and 1920, and the yields for 1920 are taken from reports made by J. A. Ramey of the Bureau of Crop Estimates.

COUNTY.	ACRES.			BALES PRODUCED.		
	1920	1919	1918	1919	1918	1920
Adams	12,006	12,506	12,893	1,928	5,386	2,800
Alcorn	20,000	17,694	18,823	8,379	7,969	7,694
Amite	35,690	35,132	37,375	6,375	10,604	8,093
Attala	27,060	24,369	7,354	7,354	8,130	4,095
Benton	14,400	15,920	16,936	6,529	6,577	6,078
Bolivar	248,000	234,919	288,799	106,898	124,936	114,000
Calhoun	13,500	14,160	10,261	5,218	4,815	2,454
Carroll	25,060	27,757	26,186	7,526	9,927	4,481
Chickasaw	26,400	27,759	27,215	9,337	10,272	6,851
Choctaw	7,070	7,373	6,956	2,524	2,273	1,331
Claiborne	20,270	23,746	22,833	3,030	6,858	4,453
Clarke	8,700	9,270	9,088	2,794	3,596	2,238
Clay	16,000	18,776	20,409	6,178	8,190	5,017
Coahoma	173,000	180,037	232,263	70,098	83,056	80,057
Copiah	21,000	28,408	24,281	5,358	8,348	5,427
Covington	21,250	14,567	15,834	4,805	5,765	7,147
DeSoto	60,200	67,467	77,548	26,272	31,879	18,891
Forrest	8,300	3,032	2,888	1,848	1,950	1,690
Franklin	16,600	9,634	12,677	2,961	5,335	3,580
George	2,220	2,105	1,986	----------	1,500	469
Greene	1,740	1,681	1,528	----------	1,100	437
Grenada	22,000	25,565	24,118	8,106	8,817	2,682
Hancock	470	450	154	----------	150	137
Harrison	850	782	460	----------	210	213
Hinds	73,700	77,639	82,584	20,317	29,664	17,460
Holmes	74,500	81,769	91,875	23,644	24,694	22,599
Issaquena	15,000	23,628	25,683	5,706	10,527	3,281
Itawamba	17,100	17,013	16,203	3,875	4,518	3,577
Jackson	340	309	300	----------	150	135
Jasper	17,040	17,094	16,126	3,896	6,538	3,449
Jefferson	23,400	22,845	23,797	4,009	10,354	5,234
Jeff. Davis	31,370	24,744	24,740	6,543	8,754	10,500
Jones	19,700	18,848	20,051	4,473	7,853	4,039
Kemper	18,000	18,804	20,439	3,719	7,673	3,386
Lafayette	11,800	12,571	10,837	6,969	4,557	3,580
Lamar	1,840	1,762	1,874	1,549	2,274	423
Lauderdale	14,000	13,940	13,500	4,488	6,483	2,654
Lawrence	26,900	25,621	25,981	6,920	9,060	7,946
Leake	25,000	27,115	27,688	6,007	7,077	5,276
Lee	33,500	37,894	38,667	15,235	16,108	11,316
Leflore	98,400	108,920	137,220	45,399	63,614	38,025
Lincoln	34,440	27,258	29,310	7,710	9,916	9,844
Lowndes	23,160	37,514	32,340	7,892	10,263	3,892
Madison	80,000	58,103	61,812	16,923	21,140	20,117
Marion	23,110	23,742	18,405	5,249	5,392	5,335
Marshall	51,000	56,538	58,895	20,573	19,828	18,672
Monroe	37,500	44,224	45,127	13,194	15,087	7,050
Montgomery	10,700	19,304	17,549	5,819	6,534	2,032
Neshoba	16,000	18,418	18,794	5,373	7,749	3,682
Newton	19,400	19,091	18,357	4,382	7,800	2,950

COUNTY.	ACRES.			BALES PRODUCED.		
	1920	1919	1918	1919	1918	1920
Coxubee	39,800	43,594	45,410	8,477	16,751	10,326
Oktibbeha	12,700	18,731	16,875	3,558	5,029	2,263
Panola	72,000	79,248	79,248	27,070	22,514	19,100
Pearl River	2,710	2,440	2,000	.....	1,200	482
Perry	3,790	3,570	3,400	1,027	1,599	634
Pike	30,700	30,772	30,169	8,772	9,157	8,865
Pontotoc	22,500	30,947	25,576	9,322	7,111	7,540
Prentiss	18,800	24,804	22,346	5,882	6,429	8,236
Quitman	70,300	70,410	80,835	26,666	34,515	30,950
Rankin	15,900	16,286	15,967	4,804	6,360	3,660
Scott	20,000	20,562	18,648	5,533	5,468	4,066
Sharkey	33,000	58,758	62,509	13,801	25,365	11,396
Simpson	21,900	18,130	20,144	5,158	7,286	5,733
Smith	27,400	27,085	22,955	5,237	8,038	6,019
Stone	1,700	1,392	1,200	.....	510	249
Sunflower	181,000	187,839	205,673	62,814	89,690	70,839
Tallahatchie	84,200	92,948	99,519	36,979	46,529	28,422
Tate	56,060	59,014	64,146	17,888	19,526	17,349
Tippah	18,500	19,991	18,683	8,468	5,952	8,053
Tishomingo	13,400	20,438	21,290	5,844	5,994	5,160
Tunica	70,100	69,430	86,388	36,625	34,175	29,331
Union	16,200	16,591	16,619	8,478	6,169	7,770
Walthall	19,900	20,126	18,464	5,546	6,825	5,600
Warren	18,500	28,961	31,825	6,140	12,906	3,085
Washington	126,000	143,081	168,702	44,097	72,233	31,697
Wayne	12,100	11,898	13,520	2,165	3,814	1,578
Webster	18,100	14,670	15,606	5,886	5,538	3,029
Wilkinson	8,100	16,251	15,778	1,786	5,896	1,597
Winston	8,700	9,861	9,861	3,595	3,854	2,147
Yalobusha	23,100	24,908	18,451	7,579	7,050	2,833
Yazoo	75,700	85,608	97,455	18,203	28,618	22,963
Humphreys	51,000	43,500	50,000	17,733	24,694	17,224
State	2,792,546	2,950,000	3,132,000	960,886	1,226,051	884,925

STATE COTTON CROP REPORT.

	1920	1919	1918	1917	1916
Number of acres	2,793,000	2,950,000	3,132,000	2,788,000	3,110,000
Average yield per acre, pounds of lint	151	154	187	155	125
Average price per pound, Dec. 1—cents	14.8	37.5	27.8	28.5	20.5
Number of bales, 500-lbs. gross weight	885,000	961,000	1,226,000	905,000	812,000
Average gross value per acre, basis Dec. 1 price	$ 22.35	$ 58.12	$ 51.99	$ 44.18	$ 25.62
Total Value of Crops, basis Dec. 1 price, dollars	62,418,000	177,375,000	170,421,000	129,041,000	83,209,000

SOURCE OF SEED IN 1920

In 1920 seed was obtained from about the same sources as in 1919. Varieties not included in the 1919 list or obtained from other parties are given below.

Acala No. 5	Nunn Seed Co., Porter, Oklahoma.
Cleveland (Coker's)	Pedigreed Seed Co., Hartsville, S. C.
Cook-1010	J. T. Williamson, Auburn, Ala.
Hartsville-12	Pedigreed Seed Co., Hartsville, S. C.
Hartsville-14	Pedigreed Seed Co., Hartsville, S. C.

MISSISSIPPI
AGRICULTURAL EXPERIMENT STATION

Bulletin No. 188

A Report of Work at McNeill Branch Experiment Station

FROM 1912 TO 1917 INCLUSIVE

By E. B. FERRIS

DECEMBER, 1920

J. R. RICKS, DIRECTOR
AGRICULTURAL COLLEGE, MISSISSIPPI

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R. M. REA, B. Sc. ..... Farm Foreman, Delta Branch Station
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INTRODUCTION

The last report covering in detail the work done at this station was issued in 1912 and covered the years 1907 to 1911, inclusive. Previous to this bulletin, these reports had been made annually and five of them had been issued. Since the report in question was written several bulletins on special subjects have been published here including two joint reports with the other three stations in the state covering work with cotton and one such report covering work with corn. These special bulletins have been as follows: a revised edition of a previous bulletin on "Clearing Pine Lands," reissued as Bulletin No. 159; No. 160 "The Cut-Over Lands of South Mississippi"; No. 163 "Truck Crops for South Mississippi"; No. 166 "Dairying on Cut-Over Lands"; No. 180 "Pasture and Forage Crops for South Mississippi"; and No. 179 "Velvet Beans." The present report will cover the work from 1912 to 1916 and that part of the work of 1917 that has been finished up to August 1st, except such work as is covered by the special bulletins listed above.

For twelve years from 1902 to 1913, this station conducted hundreds of tests with fertilizers under all classes of crops and got a pretty clear idea as to the actual requirements of these soils. After 1913 it was thought best to eliminate many of these experiments and to go more largely into livestock, having been convinced by the early work that success with these soils was almost out of the question except with the aid of animal manure and more restorative crops, livestock being necessary not only to make this manure but to furnish a market for the restorative crops. With this end in view several new projects have been started here with livestock during the years covered by this report.

Beef Cattle.—In the summer of 1914 thirty six head of native cattle were bought as a nucleus for a herd of grade beef cattle. The price paid for these cattle was $13.50 per head and one can judge of the size and quality of them by the price paid. A little later a registered Aberdeen Angus bull was bought and kept nearly a year when he died of tick fever. A second bull of the same breed was bought in the summer of 1915 and is now running with this herd while for a short time a registered Hereford bull was borrowed and kept with the herd so that we have now grade heifers of two beef breeds. There are now some eighteen or twenty of these grade beef heifers and the plan is to dispose of the native cattle during the present year. A one hundred ton silo was built in 1914 for storing feed on which to winter these cattle and they have been fed for three winters a ration of about fifteen pounds of silage and one and one quarter pounds of cottonseed meal per head per day. As the cows have had calves they have been weighed and tagged and records kept of the weights of the dams, and of the calves at birth. These cows and calves have also been weighed at regular intervals since that time.

The pastures on which these cattle have been kept have proven almost worthless and although they have had access to 220 acres fenced and to a great extent cleared of bushes, we have not been able to confine them to pastures in summer but have had to turn them on the range in order that

they might live. For three winters we have spent the time not needed in regular work of the farm in trying to improve this pasture and have planted Bermuda grass on furrows ten feet apart over a good deal of this pasture. This Bermuda has failed to give any better pasture than the native grasses, except where it was fertilized, and weeds and oak sprouts, even after the land had been cleared of underbrush, have come in so thickly that during the past winter we set to work getting rid of stumps on all pasture land so that mowing machines might be run over them to keep down these pests. A lot of this pasture land has been fertilized with acid phosphate or raw phosphate rock, Bermuda seed scattered over it, the land flat broken and disked, and lespedeza seed planted. During the past winter about forty acres of this pasture land was treated in this way and lespedeza sown in February; this has come up to a good stand and promises to make the best pasture of anything so far tried here. Bermuda grass will give more grazing on the best land but on the unimproved soils treated only with phosphates, the lespedeza grows much more vigorously. The question of pastures for this section will be found discussed more in detail in a bulletin just issued on "Pasture and Forage Crops for South Mississippi."

Goats.—In order to keep down the briers and bushes that give so much trouble in these pastures, a few Angora goats were bought in the spring of 1916 and an attempt made to confine them where they would get full benefit of such forage. However, the trouble came in confining the goats, for we soon found that they had absolutely no respect for fences and that without spending hundreds of dollars to build new fences these goats would soon have destroyed every crop on the place. With a fence, too, that would stop a razor back pig, the goats, when not able to go over would attempt to go through or under, and would get their heads caught in the attempt, so that more time was required of an attendant getting them out than the profit on the goats could possibly have amounted to, so that our greatest problem now is keeping the goats. Our conclusion has been that a woven wire fence fully fifty inches high is necessary to confine a goat and that the upright stays in such a fence must be twelve rather than six inches apart so that when they get their heads through they may be able to get them out.

Sheep.—In 1916 nineteen head of native ewes already bred were bought and in the winter just past a registered Shropshire buck and two ewes were added to the flock. All but one of the native ewes had lambs during the fall and winter and on the whole we are much pleased at the way they have done. These sheep were wintered on oat pasture as numerous efforts at making them eat silage, cottonseed meal or other feeds used on the place proved unsuccessful.

Dairy Cattle—The same character of work heretofore reported with dairy cattle has been continued and a herd of some 50 cattle, including bulls, cows, heifers and small calves, has been accumulated, besides a number of cows that have been sold each year. We have tried to keep an average of twenty cows giving milk all the time and have marketed products of the herd as whole milk during the winter to milk companies in New Orleans and to

a great extent as cream during the summer to ice cream companies in Laurel and Hattiesburg. All the feed that these cattle consume, except cottonseed meal, is raised on the farm, largely as silage made from corn and sorghum; as hay made from oats and lespedeza, but largely as oat straw saved when oats are thrashed; as pasture from fall sown oats; and latterly as velvet beans which we believe it possible to use very largely as a substitute for cottonseed meal, thereby making it possible for the South Mississippi dairyman to produce on his farm all the feed necessary for a maximum production of dairy products. During the past fall and winter a good many velvet beans were picked here and fed to dairy cattle in place of cottonseed meal, and it was found that the beans unground in the pods had a feeding value approximately fifty percent as great as that of cottonseed meal; that the cattle relished them fully as well; that a ton of these beans per acre could be made with corn without materially reducing the yield of this corn, and that these beans could be picked at a very small fraction of their feeding value.

The dairy herd has been decidedly the most attractive feature of station work and in order to make it appeal more to the casual observer and especially to the school children of the county who visit the station in large numbers during the school term, we added last year to the herd, composed largely of Jerseys, two representatives each of two other breeds of dairy cattle, the Holstein and the Ayrshire. The same trouble has been experienced in producing pasture for these cows as has been mentioned under the head of beef cattle. Really it has always been necessary here to feed practically as much in summer as in winter since no reasonable amount of land fenced and devoted to pasture has yet done very much towards producing a flow of milk and it has not been possible here to utilize the range with the dairy herd. An additional silo was built in 1914 at the dairy barn which with the one already there gives us storage space for one hundred and fifty tons of silage. This silage has been fed from early fall until about the middle of June and is very necessary here in the spring, since this season is usually very dry and pastures amount to almost nothing until the summer rains begin.

Mule Colts.—A jack was kept here for several years up to about eight years ago when he was exchanged with the Holly Springs station for a stallion. The people here at that time had never cared to patronize a jack enough to make one pay, but as soon as this one was disposed of they manifested great interest in mule breeding and again to help them as much as possible we arranged for the return of this same jack and he was brought back in 1916.

This station raised a number of mule colts during the first six years of its existence and sold several very fancy mules besides raising the teams that have been used here to do the bulk of the farm work. These mule colts manifested no tendency whatever to have eye trouble but as soon as the jack was disposed of and a stallion used, three different horse colts sired by two different stallions lost their eyes before they reached maturity.

In order to revive the mule breeding work, two Suffolk Punch mares were bought in 1916 and are being bred to the jack but so far we have not been successful in getting a colt. The services of this jack are offered to the people here at eight dollars stud fee, payable when the colt drops, but, except as a means of helping the country, the keeping of such an animal is a very poor business proposition since very many of the colts are never paid for. This station has allowed the service of its dairy and beef bulls free of charge to local people and has also extended the same privilege to its boars. So few people here are interested in improving the breed of cattle or hogs that the fact that the service is free has never made the patronage burdensome, it being lots easier to let these things happen on the range than to drive the animals a few miles to the best male of their kind.

Additional Machinery.—With two additional silos to fill it became necessary in 1914 to buy larger machinery with which to fill them, so during that year we got a ten horse power kerosene oil engine, a thirteen inch silage cutter with the necessary blower and pipe for elevating and distributing this silage uniformly over the silo. In order to help out the local people this machinery has been used to fill the silos of a number of different owners of silos in the country close enough to move it economically. As a direct result, perhaps, of the building of the silos at this station four others have been built by private individuals within a radius of five miles of McNeill and all of these have been filled with our machinery; besides the director here has given every assistance to them possible so as to get the work of building these silos done at a minimum cost. In 1914, also a threshing machine was bought and has been used largely to thresh oats which have been grown here every year and have served a threefold purpose of acting as a winter cover crop, have furnished grazing in the winter for dairy cattle, sheep and hogs, and in the end have made a lot of grain. Without the thresher these oats were largely wasted in feeding and the rats destroyed still more of them in storage. A grain drill was purchased with the thresher and has largely been used here to put in all oats planted, besides has been let out to the neighbors to do similar work.

Community Work.—Previous to 1916 Pearl River County, in which this station is located, had no farm demonstrator and the local director here has done in this end of the county a great deal of work that properly belongs to such an agent. This work has consisted in laying out terraces, inoculating cattle and hogs against charbon and hog cholera, testing dipping vat solutions and giving stereopticon lectures on agricultural subjects at farm and school meetings. In the model school work organized in 1916 in Pearl River County the local director has rendered every assistance possible in visiting the schools and communities engaged in the work and in helping with such work as has been done at the Agricultural High School at Poplarville.

Fruits and Vegetables.—During the early years of this station a great deal of work was done with fruits and vegetables, both in an experimental way and as a demonstration of what might be expected from such crops on

cut-over lands from a money standpoint. The results from most of this work has been discontinued, for one reason that there was nothing more of value to be accomplished from it and for another that it required all the available land of the station and consumed all its funds to carry on work, with livestock and grow such crops as are required to feed this livestock.

During the past winter a cooperative demonstration with pecan trees was started by a neighbor who owns an adjoining farm, this station supervising the preparation of the land, etc., and the owner of the farm bearing all of the expense. Four of the standard varieties of pecans were used and a total of one thousand trees put out. Reliable data on pecan culture is very much needed as this station gets a great many inquiries from all over the country asking for information about pecans. Much of this information can be had from this cooperative work and we regard it as a very valuable opportunity to get at practically no cost data that we would otherwise have neither the land nor the money to get.

The two hundred and fifty orange trees mentioned in a previous report as having been put out during the winter of 1911-12 have done fairly well after the first winter when a good many of them died, we believe, from having dried out too much between the time they left the nursery and the time they were set in the orchard. The trees that died the first year were reset the following winter so that now, with the exception of a few trees killed during the past winter, the orchard has nearly a complete stand and the trees appear vigorous and fairly uniform in size and shape. These trees bore a few oranges in 1914, and in 1915 they set a lot of fruit which was largely blown off by a September storm and in 1916 they brought to maturity a fairly good crop of oranges which were sold largely on local markets. Each winter the dirt has been banked around the trunks of these trees about one foot high to protect them against possible fatal freezes and up to the past winter this has apparently been unnecessary, but two hard freezes during the winter of 1916-17, following very warm spells, would likely have killed a big percent of these trees but for this banking. As it was, none of these trees, not even the regular oranges, were killed outright and none of the Satsumas were killed at all. A good many of the varieties other than Satsumas were killed back to the more mature wood and will bear little or no fruit this year, but they have since put out new growth and show now little or no effects of the freeze. These trees have not been sprayed at all up to the past winter, but since February of this year have been sprayed twice with Schnarr's Insecticide against the white fly and scale insects.

Four trees each of seven varieties of peaches were set out in February of 1916 with the hope that at least fruit might be grown for home use. From results obtained here and by individual farmers who planted peach orchards in the community fifteen years ago, we could not recommend peaches as a commercial crop, except for those who will spray regularly. San Jose scale continues to trouble all kinds of fruits and especially the

peach borers are very troublesome and several other troubles and diseases make this crop a very uncertain one for the average farmer unaccustomed to spraying and who will not fight pests and diseases systematically.

A great many inquiries have been referred to this station for information about figs and in answering them we have always had to depend upon the work done years ago at the Ocean Springs Branch Station which was altogether unfavorable to the fig as a field crop. We have no reason to doubt the correctness of this conclusion, but on account of the recent demand for facts about this crop, we believe it would be well to put out an orchard of at least one hundred fig trees here to be given regular field cultivation such as would be necessary in growing large orchards in this fruit.

We believe also that this station would do a very valuable service to the section as a whole by inaugurating some forestry work and that it might be well to utilize the fifteen hundred or more acres of cut-over land that the station owns in some inexpensive project of reforestation. This country has made its reputation in a commercial way from its growth of pine timber and in the fifteen years that we have been here we have seen small pine saplings grow into merchantable trees, the increase in value being sufficient to pay good interest on a reasonable valuation of the land. Thousands of acres of these cut-over lands in every township are unfit for cultivation and if the scattered small pines already on them could be protected and additional trees started, we believe that an investment in such lands for such purposes would in the long run pay better than in trying to utilize them for grazing purposes alone. The value of such lands is small to begin with and unless some better system of assessments and taxation is inaugurated than exists at present time, this alone might discourage any general use of such lands for such purposes.

Every winter for eight years or more this station has grown cabbage during the winter months, planting the seed in the fields where they were to grow just as turnips and rape are usually planted. Up until the past winter we have had perfect success in growing them in this way, but during the last winter three successive cold spells killed as many different plantings of cabbage and in the end the crop was a complete failure.

While no strictly experimental work has been carried on with truck crops during the period covered by this report this station has each year grown a few of the standard truck crops of the community in an effort to help out in shipping these crops in car lots and during the spring just past, from an acre of beans and a fraction of an acre of Irish potatoes we contributed to two car lots shipments of these crops, even the yields of all such crops here were cut in half by the drought. McNeill has built up something of a reputation as a shipping point for snap beans and sweet potatoes and it has been due largely to the initiative of this station that such work was started. This station has done a great deal of work with strawberries and have found them to be the most reliable of all the small fruits. An effort

has been made all along to induce the local farmers and truckers to plant this crop in sufficient quantities to ship in car lots but the length of time between starting this crop and the beginning of profitable bearing has been too long to make it appeal to them. This has also been the case with asparagus which has also been grown here very successfully.

As we see it, the greatest handicap to successful and profitable agriculture in this part of the long leaf pine belt is the lack of sustained effort on the part of those engaged in it. Unless profitable returns are to be had at least within a year the people become discouraged and frequently leave the farms entirely and go back to public work. Such a policy would fail in almost any agricultural section and especially here, where the lands are poor, even when freshly cleared and where no system of farming will likely prove profitable without the aid of livestock and permanent cropping systems. The majority of the farmers in this part of Pearl River County are men who in the past have lived as woodsmen or from work connected with the turpentine and lumber industries and farming with them has either been a side line or something that they have worked at only when industrial conditions were bad and lumber and turpentine dull.

For years this station has grown grapes very successfully and can recommend them as a very reliable crop, especially for home consumption, and since fruits in the country as a whole are very scarce we feel that every family should start a scuppernong arbor and have in addition a few vines of other grapes. In 1909 four varieties of grapes, the Delaware, Concord, Brighton and Moore's Early were set out and later trained on trellis. Without giving any more attention than to prune them each year these grapes bore for eight years respectable quantities of grapes that answered all the requirements for home use and which with proper spraying would have made them marketable in competition with grapes grown in other places. The extremely wet summer here when the fruit is usually ripening has proven a great handicap in making them hold up in shipment. Of the four varieties mentioned, the Delaware seemed best suited to local conditions though scuppernongs are better adapted to South Mississippi conditions than any other grape, requiring the spraying, very little pruning, an arbor started here twelve years ago having borne freely for ten years with no more attention than some pruning of the vines once a year, and some little effort at keeping up the frame to support the vines.

STAPLE CROPS.

Cotton.—Up to 1914 cotton was grown here every year and until the boll weevil came was decidedly the most reliable crop with which to conduct fertilizer experiments that had ever been tried, being less affected by seasons than any of the other staple crops and responding much more uniformly to changes in the composition of the fertilizer used under it. The weevils were so bad in 1913 that we decided to stop growing the crop for two years with the hope of being able to get some data as to the effect on the

weevil of leaving off cotton entirely for a time and then starting to grow it again. This could have been done here better possibly than by any other station in the country since this section as a whole had almost entirely stopped growing cotton. In 1916 we began planting cotton again and up to the 4th of July had the prettiest prospect for a crop that we ever had here before. On the fifth of July the worst wind and rainstorm in the history of the country came and completely ruined this cotton so that the results were absolutely worthless and were not kept. Detailed results have been published of all this work with cotton, the work for 1912 and 1913 being given in Bulletins 161 and 164, issued jointly by the four stations in the state.

The following table gives a summary of the work here with fertilizers under cotton and in our judgment the average of all these results gives a better idea of the relative importance of the several elements of plant food on the soils of this county than any other work that has been done here or elsewhere. Each year's results are the average of work done in triplicate on permanent fertilizer test plats that had been fertilized alike for a number of years and where every precaution was used to do away with variations in yields due to inequalities of the soil.

TABLE 1—FERTILIZER PLAT TESTS WITH COTTON.

Fertilizers Calculated in Pounds per Acre.								Yields of Seed Cotton Per Acre.								
No. of Plat	Cotton seed Meal	Acid Phos-phate	Kain-it	Ground Phos-phate Rock	New Jersey Meal	Raw ground Bone	Lime & Acid Phos. Mixture	1906	1907	1908	1909	1910	* 1911	1912	1913	Av-er-age.
1	0	0	0	0	0	0	0	480	220	110	153	20	30	233	43	161
2	100	0	0	0	0	0	0	760	436	376	400	90	63	538	210	359
3	0	100	0	0	0	0	0	800	514	744	480	366	166	846	300	527
4	0	0	100	0	0	0	0	620	300	274	186	34	8	480	120	253
5	100	100	0	0	0	0	0	1060	616	644	513	326	292	744	440	580
6	100	100	100	0	0	0	0	860	640	693	520	306	300	764	496	572
7	200	100	0	0	0	0	0	1040	756	684	620	306	370	922	530	653
8	100	200	0	0	0	0	0	1000	666	636	480	254	340	730	453	570
9	100	0	0	0	500	0	0	620	420		360		140		330	374
10	100	0	0	100	0	0	0	840	510		520		220		447	507
11	100	0	0	0	0	165	0			720						720
12	100	0	0	0	0	0	400			680		460		860		666
Land Pastured by Cattle Winter of 1902-3																
13	100	0	0					1540	1120	920	624	180	490	1055	450	800
14	100	100	100					1485	1090	870	633	170	510	1135	390	785

*. All applications of fertilizer doubled in and after 1911.

After the disastrous results with cotton in 1916 we made no effort to grow it here in 1917. In fact, the summers here are entirely too damp for cotton even without the boll weevil and with this pest we cannot recommend the crop at all and would urge the people of at least two tiers of counties near the Gulf Coast to grow other crops better suited to the natural conditions. Our work with commercial fertilizers alone under all classes of crops, which is particularly shown here in results with corn and cotton, proves conclusively that these lands cannot be cropped economically without the aid of livestock and the manure that they furnish and in accompanying tables giving the results of this work compare the results on plats 1 to 12 inclusive with those of plats 13 and 14 and see the almost miraculous

effects of animal manures as applied to the land by feeding steers thereon and note how this effect lasts even up to 1913, eleven years after the cattle were fed on this land.

Corn. (Fertilizer test).—Up to and including 1913 fertilizer tests with corn were carried on here every year, but as is easily seen from the accompanying table this corn was not being grown economically and it was decided to adopt some other line for experimental work and since corn and other crops had been profitably produced on land where cattle had been parked in 1902, it was decided to make livestock the leading feature of our work. The table below gives this work with fertilizer under corn for a series of years and the average results as given ought to represent in a most accurate manner the plant food requirements of corn on such land.

TABLE 2—FERTILIZER PLAT TESTS WITH CORN.

Fertilizers Calculated in Pounds per Acre.								Slipshucked Ears in Lbs. per Acre.								
No. of Plat	Cotton seed Meal	Acid phos-phate	Kain-it	Ground Phos-phate Rock	New Jersey Meal	Raw ground Bone	Lime & phos-phate Rock	1906	1907	1908	†1909	1910	*1911	1912	1913	Av.
1	0	0	0	0	0	0	0	1051	153	66		560	793	124	170	417
2	100	0	0	0	0	0	0	1699	740	446		860	1406	346	290	827
3	0	100	0	0	0	0	0	2037	1380	846		840	1880	1217	400	1156
4	0	0	100	0	0	0	0	1339	1713	173		520	1072	204	190	601
5	100	100	0	0	0	0	0	1886	1200	1073		1220	1792	990	600	1257
6	100	100	100	0	0	0	0	1059	1333	1066		1280	1832	1070	680	1331
7	200	100	0	0	0	0	0	1944	1466	1200		1360	2000	1320	610	1414
8	100	200	0	0	0	0	0	1807	1306	860		1380	1712	1000	540	1229
9	100	0	0	100	0	0	0			1193		1400		976		1149
10	100	0	0	0	100	0				600		1020		990		870
11	0	0	0	0	0	165	0	2094	1526							
12	100	0	0	0	0	0	400	1900	1473				2020			
13	100	100	0	0	0	0	0	2630	2060	1800		2286	1840	1760	1080	1913
14	100	100	100	0	0	0	0	2390	1760	1600		2120	1780	1640	1080	1767

†Corn destroyed by worms.

* All applications of fertilizers doubled in and after 1911.

Considerable work with fertilizers under both corn and cotton has been done here on the rotation plats and is reported under this head. Also corn has been grown a number of years on the permanent fertilizer test plats which have been used with the particular end in view of testing the relative merits of acid phosphate and raw phosphate rock. Some temporary work with fertilizers under corn has also been done to test the effects of different forms of potash. In 1912 four plats of land of one-tenth acre each was used to test the effects of potash in large quantities per acre on the yields of corn. All four plats were fertilized with a mixture of equal parts of acid phosphate and cottonseed meal at the rate of 300 pounds per acre. In addition to this, plat 2 was given 160 pounds of kainit, plat 3, 40 pounds of muriate of potash, and plat 4, 40 pounds of sulphate of potash. The corn was planted soon after the fertilizers were applied and gave yields as follows, calculated in pounds of slip-shucked ears per acre:

Plat 1—150 lbs. C.S.M., 150 lbs. A.P. and no potash gave 4650 lbs. of corn.

Plat 2—150 lbs. C.S.M., 150 lbs. A.P. and 1600 lbs. kainit gave 3850 lbs. corn.

Plat 3—150 lbs. C.S.M., 150 lbs. A.P. and 400 lbs. muriate of potash 3900 lbs. corn.

Plat 4.—150 lbs. C.S.M., 150 lbs. A.P. and 400 lbs. sulphate of potash, 3500 lbs. corn.

Peas were planted in this corn at the last cultivation and were grazed off by cattle in September and the same plats planted to oats in October without additional fertilizer and gave yields as follows, the following spring calculated in pounds of oat hay per acre: Plat 1, 1500 lbs; plat 2, 2000 lbs; plat 3, 1900 lbs; plat 4, 1600 lbs.

The plats of land that had grown corn and velvet beans for two years previous to beginning this experiment were fertilized with acid phosphate alone, raw phosphate alone and a mixture of raw phosphate rock and cottonseed meal and planted to corn. They gave yields as follows: 200 lbs. per acre gave 1813 lbs. corn in the ear; 200 lbs. raw phosphate rock gave 1160 lbs. of corn in the ear; and a mixture of 200 lbs. of raw phosphate rock and 200 lbs. of cottonseed meal gave 2088 lbs. of corn in the ear.

In 1915 three plats of land of one acre each were fertilized with three forms of phosphatic fertilizers with a view of testing the relative value of each. The first planting ever selected that it did not yield well and was worth very little as grain, so it was used for silage and gave yields as follows, in tons of silage per acre:

400 lbs. Duplex Basic Phosphate Slag, 200 lbs. cottonseed meal..3.68 tons
400 lbs. Thomas Slag and 200 lbs. cottonseed meal.....3.2 tons
400 lbs. Acid Phosphate and 200 lbs. cottonseed meal.....3.4 tons

Corn. (variety test).—In 1912 twenty seven varieties of corn were planted here, three rows being used for each variety and these rows so placed on the land as to do away as nearly as possible with variations in yields due to inequalities of the soil. This corn was given an application of equal parts acid phosphate and cottonseed meal at the rate of 300 lbs. per acre before planting the corn and a second application of 80 lbs. nitrate of soda and 200 lbs. acid phosphate on June 12th. Corn was gathered when perfectly dry and gave yields as follows calculated in bushels per acre: Hasting's Prolific, 34.0; E 1, 33.8; Tennessee Red Cob, 33.5; Florida Flint, 32.8; Munsen, 32.2; Huffman, 32.0; Batts 4-Ear, 30.3; Davis Poor Land, 30.3; Mosby from E. M. Carr, 30.3; Selected corn from A. L. Livings, McNeill, Miss., 29.8; Shoe Peg, 29.7; Gourd Seed, 28.7; Yellow Dent, 28.5; Cockes Prolific, 28.3; Mosby, 28.1; Chisholm, 27.2; Sure Cropper, 27.2; Mexican corn from E. C. Ewing, Agricultural College, Miss., 27.0; Goodbye Poor Land, 26.0; Marlboro Prolific, 25.7; Big Rockdale, 24.5; Northern Grown Boone County White, 23.2; Square Deal, 23.0; Welchell, 22.8; Funcks 90-day, 22.7; Unselected corn from M. D. Tate, McNeill, Miss., 18.5; Northern Grown Leaming, 17.5.

In 1913, similar work was done with varieties of corn using two rows to the variety and distributing these so as to eliminate the effect of variations in the soil. This corn was fertilized in much the same way as similar corn had been fertilized in 1912 and gave results as follows, calculated in bushels of corn per acre: Vardaman, 37.2; Cockes Prolific, J. B. Allen, 36.1; Corn from Otto Schwill & Co., Memphis, 35.2; Batts 4-ear, 34.7; Florida Flint, 33.8; Anderson's Poor Land, 33.6; Brunsen's Improved Prolific, 33.5; Hasting's Prolific 6-ear, 32.7; Jones' Prolific, 32.7; Davis Poor Land, 31.9; Beene County White, 31.3; Cockes Prolific, T. W. Wood & Sons, 31.0; Cockes Prolific, 29.1; Gourd Seed, 29.1; Leaming, 28.8; E-1, 28.5; St. Charles White, 28.2; Silver Mine, 27.7; Mosby, 27.1; Station Mosby, 26.8; Welchell, 26.3; Reid's Yellow Dent, 26.0; Eureka Ensilage, 24.9; Hickory King, 23.5; New Era, 22.9; Hasting's Big Rockdale, 22.9; Munsen, 22.9; Funcks 90-day, 21.5; No Name, 21.5.

In 1914 eighteen varieties of corn were tested here in practically the same way as in the two previous years with results as follows: Tennessee Red Cob, 33.4; New Era, 33.3; Vardaman, 31.7; Hasting's Prolific, 30.8; Cockes Prolific, 30.0; Davis Poor Land, 29.1; Jones' Prolific, 25.7; Mosby Prolific, 25.7; Boone County White, 25.7; New Era, Ala. Experiment Station, 25.2; Florida Flint, 24.8; Batts Prolific, 23.6; Rhodes Mosby, 23.5; North Carolina Seed Corn, 21.0; Rockdale 20.5; Munsen, 16.3; Holden from J. B. Holden, Richton, Miss., 12.9; Leaming, 10.1.

In 1915 a number of varieties of corn were planted but were completely ruined by a protracted drought and the results are not worth reporting. In 1916 fourteen varieties were planted and these were so completely ruined by the storm of July 5th that we had to cut the stalks and save as silage. These were weighed with results calculated in tons of silage per acre: Williamson, 4.35; Goliad, 4.2; Marlboro, 4.1; Vardaman, 3.76; Mosby 156, 3.7; Henry Grady, 3.6; Cockes Prolific, 3.45; Thomas, 3.45; Tennessee Red Cob, 3.4; Mosby 119, 3.15; General Mosby, 3.0; Boone County White, 2.8; Jones' Prolific, 2.65; Florida Flint, 2.45.

Corn has been grown at the station very largely for filling three silos with a capacity of 250 tons as well as to furnish the most of the grain for about six head of horses and mules and a number of hogs. Work with sorghum as a substitute for corn for silage was started here last year and the yields were so much heavier than in 1917 that Japanese sorghum has been planted on a large part of the acreage heretofore devoted to corn, and since a drought in 1917 lasting from the 10th of April to the 5th of July practically ruined all the March corn in the country, it is well that the change was made since this sorghum was able to wait for the rains and while planted very early, now gives promise, after the rains have come, of giving an immense tonnage.

Sorghum.—Results with work done here with various saccharine and non-saccharine sorghums during the period covered by this report have been reported in detail in a bulletin issued by this station on "Pasture and For-

age Crops for South Mississippi." While we would prefer silage made from first class corn to that made from sorghum there are so many drawbacks to growing first class corn here that we have chosen sorghum as a substitute for it. Early corn here is frequently greatly damaged by droughts that frequently prevail here during the months of April, May and June, while corn planted late is frequently almost ruined by worms. Sorghum will wait for the rains and still make good yields while corn has little power in this direction. Our experience has been that worms trouble sorghum much less than they do corn and being left much thicker in the drill they can destroy a lot of it and still leave enough to give a good tonnage. For early planting we have used some of the larger varieties like the Japanese or Seeded Ribbon Cane and for very late planting we have used the Amber. Two cuttings may be had from the earlier plantings and on the best lands the yields here have more than doubled corn even for the first cutting and with the second cutting added the best yields here from sorghum in 1916 fully trebled those from the best corn. After corn had been grown here in 1916 and had been cut for silage, sorghum was planted behind it on the same land, after the middle of August, and gave yields about as great as had been obtained from the corn, although this corn had been greatly damaged by the storm and waterspout of July the 5th and 6th.

Without harvesters sorghum is much more expensive to make into silage than is corn. The stalks are smaller and from records kept here it has cost fifty percent more to cut the sorghum in the field with knives than it has corn, besides the expense of hauling or loading and feeding into the cutter is slightly greater than with corn. Comparative records of the cost of filling silos with corn and sorghum were kept here and at Laurel and agreed fairly well in the two places. In both places the crops having been cut with ordinary corn knives and hauled to the silos in wagons. Figuring all expense for labor, teams, use of machinery, kerosene oil, grease, etc., it has cost at both places an average of $1.00 a ton for putting corn silage into the silo as compared with $1.33 a ton for sorghum. With harvesters we think the difference in cost would be very little, if any thing. The above figures are for putting these crops in the silo, not for growing them.

Cowpeas.—On account of their poor fruiting qualities as compared with the velvet or soy beans this station has almost stopped growing cowpeas in any quantity. Our experience has been that on the soils of this section nothing can be expected of cowpeas when planted in corn at the last cultivation as they are grown in so many other sections, and that if they succeed at all they must be given separate rows, must be fertilized and given some cultivation. Under such circumstances they are much less reliable than the velvet or soy beans, since they make no heavier yield of forage and frequently do not fruit at all. Only when grown for hay and when planted alone on the land would we recommend cowpeas over the other two crops. Peas have been the one crop here from which positive results seem to have been obtained showing benefits from the application of potash in a fertilizer.

In 1912 four plats of land of one-sixth acre each were fertilized alike except that one plat received no potash and the other three received three forms of potash salts in large quantities per acre. On May 16, these plats were planted to cowpeas and the same were cut for hay on September 11, having made no fruit of any consequence. The yields of cured hay per acre were as follows: Plat 1, Acid Phosphate 200 lbs. per acre, Muriate of Potash 480 lbs, per acre gave 4200 lbs. of hay; plat 2, with the same phosphorus and 480 lbs. of sulphate of potash gave 3540 lbs. of hay; plat 3 with the same phosphorus and 720 lbs. of kainit gave 3480 lbs. of hay, while plat 4 with acid phosphate alone gave only 2160 lbs. of hay. These same plats were planted immediately to oats after having been fertilized with nitrogen and phosphorus but with no additional potash. These oats yielded the following spring well cured oats hay as follows: Plat 1, muriate of potash, 3600 lbs.; plat 2, sulphate of potash, 3300 lbs.; plat 3, kainit, 3540 lbs.; and plat 4, no potash, 4080 lbs. Reference to table showing results with fertilizers on seven permanent fertilizer test plats will show that the additions of potash to nitrogen and phosphorus under peas showed also a considerable increase in yield due to the potash.

The black eye pea grown here from seed said to have been raised in California have proven the most reliable of all peas for fruiting and have grown here with great satisfaction as a table pea. They may be planted here as soon as danger of frost is over and at any time of the year seem to fruit well. On May 12, 1915, these peas were planted here following a crop of winter cabbage, were picked July 25 and gave a yield of ten bushels per acre. In 1916 they were planted early in April and had matured the crop before the fourth of July, while a later planting in alternate rows with corn had set an abundant crop of peas on the fifth of July and these were all destroyed by the disastrous wind and rain storm of that date. These peas make an admirable crop for hogs to be gathered the latter part of May and early June after oats and rape are no longer available as grazing crops for them.

Soy Beans.—This crop has been grown here every year since the station was started and is a much more reliable fruiter than the cowpea. The greatest trouble with this bean is the difficulty of getting stands and the extreme fondness that rabbits have for them. In 1912 smiliar work was done with soy beans in testing the effects of potash salts under them as is reported above with peas. But we failed to get a stand from the first planting and the second planting was destroyed by grass worms that came that year in unheard of quantities. Reference to table showing results on permanent fertilizer test plats will show the effects of different fertilizers under this crop. We have tested the crop several times as a silage proposition and while the quality of the silage made from it, especially when mixed with corn or sorghum, is good, the cost of handling them from field to cutter and of getting them thru the blower has been almost prohibitive with us. If the lands were more fertile and the beans would grow to a greater height and could be cut with a harvester, this trouble would be largely eliminated,

but when the short beans that grow here are brought to the cutter they are not only hard to feed, but the stalks sometimes go sideways thru the cutter, are left in lengths too great to be blown thru and as a consequence stop up the pipe and cause so much trouble that we have frequently hauled them away rather than go to the trouble of putting them thru. Soy beans are one of the best of the hog crops to be grazed off by the hogs in the field, but except that the growing season is much shorter they have very little advantage, even for this, over the velvet bean. In fact, for the country as a whole, we think the velvet bean much more reliable than either cowpeas or soy beans. In 1912 a number of varieties of soy beans were planted here and were destroyed by grass worms. Again in 1917 several varieties have been planted, but have not yet matured.

Velvet Beans.—The velvet bean has been grown here every year since the station was established and in our opinion is by long odds the most reliable of the crops of its class. The seed are large and little trouble is had with bad stands due to planting too deep or too shallow. None but fresh seed should be planted as old seed do not germinate. A special bulletin issued in 1917 covers in more or less detail the results of this work with beans. Previous to 1916 these beans had been grown entirely as soil builders and to be grazed off by cattle in the field, but in 1916 a lot of them were picked and fed to the cattle in the barns with results so good as to give great hope that they may be made to take the place of cottonseed meal to a large extent. These beans are grown here with corn and the usual way of handling them is to lay off the land in rows six feet apart, planting these to corn as early as possible in the spring, then three to six weeks later plant beans half way between the corn rows and thereafter work them when the corn is cultivated.

As an illustration of such work with corn and beans we will state that in the spring of 1913 a field here that has been run down from having grown sugar cane was flat broken during the winter and in early spring laid off into rows three feet apart. Alternate rows were fertilized about the middle of March with a mixture furnishing nitrogen and phosphorus and these rows were planted to corn on March 26th. On May 1st the other rows were fertilized with acid phosphate alone and planted at once to velvet beans. The corn was gathered on September 20th and made at the rate of fifteen bushels per acre. On October 30th eighteen dairy cows were turned in on one and one-third acres of these beans that had been wired off from the rest of the field. These cattle had been fed 4 lbs. each of cottonseed meal and hulls before being turned on the beans and continued to get it while on the beans, and a record had been kept of the milk produced by them previous to their having been turned on the beans. It took the eighteen cows eighteen days to eat the beans on the one and one-third acres and the flow of milk was increased seventy gallons over what it had been for an equal number of days before turning them on the beans. The milk from the herd at the time was netting us 25 cents per gallon on the cars at McNeill which made at the rate of 52.5 gallons per acre of beans, or $13.12. Other experiments of the kind to show the value of velvet beans as feed

for dairy cattle have shown them to be worth about eight dollars an acre, so that we feel safe in saying that the average crop of beans ought to be worth ten dollars an acre when fed in this wey. The same quantity of beans gathered would produce about 1500 lbs. of beans on the pods per acre and feeding tests made with them here last year showed them to have a beefing value a little less than one-half that of cottonseed meal, which is costing now two cents per pound, so that the feeding value of velvet beans in the pods would be about one cent per pound, or about fifteen dollars per acre. It costs from fifteen to twenty five cents per 100 lbs. to pick these beans besides considerable storage space. They deteriate very little if left in the fields, due to the extremely tough pods in which the beans are borne and if hogs are allowed to follow the cattle when turned on the beans the losses from tramping them into the ground would be very small. The hogs will get them even if they are plowed into the soil, as they are very fond of them and will root for them to any reasonable depth. Beans shelled and ground make one of the finest hog feeds, a good substitute for wheat shorts and grown on our own farms. Reference to the table giving permanent results with fertilizers on the seven permanent fertilizer test plats will give a good idea as to the character of fertilizer that will give best results under velvet beans.

Oats.—In the fall of 1914 one-tenth acre plats of barley, rye, wheat and rust proof oats were planted here and all were cut May 24, 1915 and weighed eight days later with yields as follows: Barley, 1500 lbs. per acre; Rye, 1100 lbs. per acre; Wheat, 800 lbs. per acre; and oats 3100 lbs. per acre. The same fall twenty acres of land was planted to oats and the following spring we cut and threshed 800 bushels of well filled oats. A large acreage was planted to oats in the fall of 1915 and again in the fall of 1917 but neither year were the yields fifty percent as great as in 1914-15. These oats were used during the winter months for grazing dairy cattle and cattle turned on them would increase in the flow of milk quicker than from any other feed ever tried here. In order to test the effects of heavy grazing on the yield of the oats we fenced off four-fifths of an acre in the fall of 1913 from the rest of the field and did not allow cattle to graze on them. The result was that the oats not grazed were about ten days ahead of these that had been grazed and gave 715 lbs. of oat hay more per acre, the ungrazed oats making at a rate of 2450 lbs. per acre, the grazed oats, 1715 lbs.

Somewhat the same character of oats in the straw as the above have been threshed here and gave about half and half oats and straw.

In the fall of 1915 twenty two plats of one-seventh acre each were planted to a variety of oats, wheat, rye and barley. The seasons were bad and all did poorly, so much so that we doubt if the results are worth anything. They were harvested May 29, 1916 and gave yields as follows, calculated in pounds of the grain in the straw per acre: Golden Chaff Wheat, 560; Purple Straw Wheat, 700 lbs.; Leaps Prolific, 770; Lancaster-Fulcaster, 770; Lancaster, 910; Fultz, 840; Red Wonder, 840; Fulcaster, 770; Stoner, 910; Dietz Mediterranean, 840; Red May Wheat, 840; Winter Barley, 700; Arlington Beardless Barley, 525; Apple Oat, 630; Virginia 0; Texas Red

Rust Proof Oat, 560; Fulgham Oat, 420; Bancroft Oat, 490; Southern Red Rust Proof Oat 560; Home Grown Red Rust Proof Oat, 700.

Reference to the table giving results with fertilizers on seven permanent fertilizer test plats will give an idea as to the plant food requirements of this crop on the soils of this section.

Sweet Potatoes.—No great amount of work has been done here with sweet potatoes since the early years of the station when we grew them in considerable quantities and introduced them as a money crop into the section. Considerable work was done then with fertilizers under the crop. After the lands here had been in cultivation several years grasses got thoroughly set in them and since that time it has been difficult to grow potatoes without doing more work in cultivating them than the crop will afford. In the spring of 1914 seven varieties of sweet potatoes were planted here on land that had been given an application of animal manure the year before. The effects of this manure was to cause the potatoes to grow too large, to crack open badly and to keep poorly when put in the house. These seven varieties were grown in plats of one-tenth acre each and gave yields as follows, calculated in pounds of potatoes per acre: Bunch Yams 144; Gold Coin 174; Porto Rican 193; Early Triumph 167; Nancy Hall 93; Golden Yams 59; Dooly Yams 91.

An interval of two weeks elapsed between the setting out of the first four varieties and that of the last three so that evidently they are hardly comparable. In numerous instances here in the past Dooly Yam potatoes have made as high as two hundred bushels per acre and while this variety has generally fallen below the Porto Rican, Triumph and Golden Coin in yields, the difference would be nothing like so great as indicated by the above results. Except that the Triumph does not sell so well on the Southern markets as do the Doolies and Nancy Halls; we prefer them here over any other kinds. The yields are heavier, the potatoes are more uniform in every way, they keep better and for home consumption are, in our opinion, the most desirable of all varieties that have been grown here.

Subsoiling with Dynamite.—On March 13, 1912 an acre of the best land here was selected for work in testing the effects of subsoiling. This acre was divided into two equal parts and one half was dynamited to a depth of thirty inches while the other half was not subsoiled. The two halves were then prepared alike, fertilized alike, and planted to corn on April 25th. This corn was cut for silage on August 9th when the subsoiled half yielded at the rate of 9,886 pounds per acre while the part not subsoiled made 11,448 lbs. Peas were planted in the corn middles at laying by time and having failed to fruit were turned into the soil when the land was prepared for oats in the fall. These oats were weighed when harvested the following spring when the subsoiled half made at the rate of 1840 lbs. of oat hay per acre while the part not subsoiled made 1410 lbs. This with other work of a similar nature done here during the early years of this station has given us the opinion that subsoiling for these lands is not worth what it costs, if, indeed, it is worth anything at all.

Permanent Tests with Raw Phosphates and Potash.—In bulletin No 158 is reported five years' work with fertilizers under a variety of crops especially oats that were followed by summer legumes. The object of this

experiment was to test the permanent effects of raw phosphate on the land as compared with acid phosphate and of mixtures of acid phosphate and cottonseed meal alone as compared with the same to which kainit had been added. In the beginning of the experiment in 1906 phosphate screenings were used as a source of phosphorus up to and including 1910, but after this 200 lbs. per acre of high grade finely ground phosphate rock was substituted for 400 lbs. of the low grade poorly ground screenings. This work is still in progress and has only been modified to the extent of leaving off the check plat in 1914 and using it after that time as a manure plat where animal manure was applied. The following table gives in detail the result of this work from 1906 to 1917 inclusive and in addition to showing the effects of the several chemical fertilizers on the yields of a number of different crops, shows also the effects of animal manures with and without phosphates on the same crops. No one could study this table without being impressed with the marked yields of all classes of crops under which animal manures were used even velvet beans, the greatest soil building plant that the country affords, being greatly increased in every instance where manure was applied.

TABLE 3—TEN YEARS' RESULTS FROM RAW PHOSPHATES AND POTASH.

No. of Plat.	APPLICATIONS OF FERTILIZER CALCULATED IN POUNDS PER ACRE.	1907 Yield of Oat Hay in pounds and Corn in bushels per Acre	1908 Yield of Oat Hay in pounds per acre on part of Plat having 80 lbs. Nitrate per Acre	1909 Yield of Oat and Pea Vine Hay in Pounds per Acre	1910 Yield of Oat and Pea Vine Hay in Pounds per Acre	1911 Yield of Pea Vine Hay in Pounds per Acre
1	400 lbs. Raw Phosphate Screenings up to 1910. After 1910, 200 lbs. finely ground Raw Phosphate Rock. 200 lbs. Cottonseed Meal	4320 lbs. Oats 26.0 Bu. Corn	4720 Oats	2480 lbs. Oats 3250 Peas	3380 Oats Peavines turned under	Oats failed 2080 Peas
2	200 lbs. 16 per cent Acid Phosphate 200 lbs. Cottonseed Meal.	4440 lbs. Oats 24.4 Bu. Corn	5360 Oats	2480 Oats 3320 Peas	2760 Oats	Oats failed 2280 Pea Hay.
3	200 lbs. Acid Phosphate 200 lbs. Cottonseed Meal 200 lbs. Kainit	5040 lbs. Oats 20.0 Bu. Corn	4960 Oats	2560 Oats 4000 lbs. Peas	2920 Oats	Oats failed 2280 Pea-vine Hay.
4	Raw Phosphate Rock as in No. 1 12 Tons Stable Manure	4880 lbs. Oats 35.5 Bu. Corn	6400 lbs. Oats	3920 lbs. Oats 5080 lbs. Peas	3480 lbs. Oats	Oats failed 3040 lbs. Pea Hay
5	200 lbs. Acid Phosphate	4640 lbs. Oats 18.8 Bu. Corn	5040 lbs. Oats	2160 lbs. Oats 3160 Peas	2640 lbs. Oats	Oats failed 2772 lbs. Pea Hay
6	Raw Phosphate Rock alone— as in 1 and 4	3480 lbs. Oats 16.1 Bu. Corn	4600 lbs. Oats	1880 lbs. Oats 2480 lbs. Peas	2640 lbs. Oats	Oats failed 2304 lbs. Pea Hay
7	No Fertilizer up to 1913 After 1913, 12 Tons Manure	2840 lbs. Oats 16.6 Bu. Corn	4360 lbs. Oats	1840 lbs. Oats 1760 lbs. Peas	2320 lbs. Oats	Oats failed 1968 lbs. Pea Hay

TABLE 3—Continued.

No. of Plat.	APPLICATIONS OF FERTILIZER CALCULATED IN POUNDS PER ACRE.	1912 Yield of Corn in Bushels per Acre with Velvet Bean turned under	1913 Yield of Corn in in Bushels with Velvet Beans turned under	1914 Yield of Oats and Soy Bean Hay in Pounds per Acre	1915 Yield of Oats and Soy Bean Hay in Pounds per Acre	1916 Yield of Corn in Bushels and Velvet Beans in Pounds per Acre
1	400 lbs Raw Phosphate Screenings up to 1910. After 1910 200 lbs. finely Ground Raw Phosphate Rock 200 lbs. Cottonseed Meal	38.0 Bu. Corn Velvet Beans grazed off and turned under	17.0 Bushels Corn	2000 lbs. Oats 3000 lbs. Soy Bean Hay	2600 lbs. Oats 3400 lbs. Soy Bean Hay	80 Bushels Corn 2600 Velvet Beans in Pod.
2	200 lbs. 16 per cent Acid Phosphate 200 lbs. Cottonseed Meal	36.1 Bushels Corn	12.0 Bushels Corn	2100 lbs. Oats 3050 lbs. Soy Bean Hay	2520 lbs Oats 3680 Soy Bean Hay	6.9 Bushels Corn 2400 lbs. Velvet B'n Hay
3	200 lbs. Acid Phosphate 200 lbs. Cottonseed Meal 200 lbs. Kainit	37.8 Bushels Corn	15.0 Bushels Corn	2060 lbs. Oats 3200 Soy Bean Hay	2720 Oats 3800 lbs. of Soy Bean Hay	7.4 Bu. Corn 2160 Velvet Beans in Pod
4	Raw Phosphate Rock as in No. 1 12 Tons Stable Manure	40.0 Bushels Corn	13.0 Bushels Corn	3000 lbs. Oats 4500 lbs. Soy Bean Hay	3480 lbs. Oats 4952 Soy Bean Hay	7.4 Bu. Corn 3080 lbs. Velvet B'n in Pod
5	200 lbs. Acid Phosphate	30.8 Bushels Corn	13.0 Bushels Corn	1800 lbs. Oats 2700 lbs. Soy Bean Hay	2280 lbs. Oats 3152 Soy Bean Hay	5.1 Bu. Corn 2160 Velv't Beans in Pod
6	Raw Phosphate Rock alone, as in 1 and 4	28.6 Bushels Corn	11.0 Bushels Corn	1810 lbs. Oats 2500 lbs. Soy Bean Hay	2240 lbs. Oats 2576 lbs. Soy Bean Hay	4.5 Bu. Corn 2160 Velvet Beans in Pod
7	No Fertilizer up to 1913— After 1913, 12 Tons Manure	17.2 Bushels Corn	5.0 Bushels Corn	2100 lbs. Oats 4000 lbs. Soy Bean Hay	2600 lbs. Oats 3900 lbs. Soy Bean Hay	7.4 Bu. Corn 2880 lbs. Velvet Bean in Pod

Rotation Experiments.—In 1903 four plats of land were set aside for permanent work with rotations, the object being to rotate the crops on three of these plats while the other was to grow cotton continuously. These plats were each one-half acre in size and each was divided into two equal parts, one-half to be fertilized each year and the other half to receive no fertilizer at all. In this way we hoped to compare rotations with and without fertilizers with continuous one crop cultivation, but the first two years convinced us that unless the peas on the three plats where crops were rotated were fertilized they would make no growth at all and therefore do no good in helping to build up the land. As a consequence, after 1904 these peas were fertilized, each time they followed oats in the rotation, at the rate of 200 lbs. of acid phosphate per acre. The rotation adopted was a three-year five-crop one, the crops being corn followed by cowpeas grown as a

catch crop; oats planted in the fall and followed by peas after the oats were harvested, the peas being fertilized after two years with acid phosphate on both halves alike; and cotton alone the third year. The cotton was always fertilized with a mixture of two parts acid phosphate and one part cottonseed meal at the rate of three hundred pounds per acre; and the cowpeas following the oats at the rate of 200 lbs. acid phosphate alone per acre. As stated, after 1905, the peas on both fertilized and unfertilized ends were given this application of acid phosphate. In 1911, seeing that the yields of the several crops were not increasing as we hoped, we began using double the amount of fertilizer indicated above.

This work was carried on through the year 1913 and was discontinued mainly because it was being carried on next to the public road and the unfertilized parts of the several plats, especially the one planted every year to cotton, showed up so poorly that it subjected the station to criticism. Members of the legislature here on a tour of inspection after seeing the crops on the unfertilized parts of these plats, reported the lands too poor to sprout or raise a disturbance on, so having demonstrated to our satisfaction that with or without rotation of crops, these lands had to be fertilized and fertilized well if they made even average yields, we decided to leave off this work.

The following table gives the yield of each plat in the respective crops calculated in pounds of seed cotton, of peavine and oat hays and in bushels of corn per acre respectively:

TABLE 4—YIELD OF THE DIFFERENT CROPS IN THE ROTATION FOR ELEVEN YEARS.

		1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
PLAT 1	Fertilized	2568 lbs. Oat Hay 3540 lbs. Pea Hay	758 lbs. Cotton	28.0 Bu. Corn 1652 lbs. Pea Hay	2800 lbs. Oat Hay 2828 lbs. Pea Hay	1044 lbs. Cotton	37.8 bushels Corn	2840 lbs. Oat Hay 4000 lbs. Pea Hay	404 lbs. Cotton	36.6 bushels Corn	4284 lbs.. Oat Hay 3780 lbs. Pea Hay	384 pounds Cotton
	Unfertilized	1920 lbs. Oat Hay 1560 lbs. Pea Hay	276 lbs. Cotton	17.0 Bu. Corn 1092 lbs. Pea Hay	1840 lbs. Oat Hay 1332 lbs. Pea Hay	504 lbs. Cotton	16.1 Bu. Corn	2320 lbs. Oat Hay 2360 lbs. Pea Hay	280 lbs. Cotton	20.0 Bu. Corn	1556 lbs. Oat Hay 2296 lbs. Pea Hay	496 lbs. Cotton
PLAT 2	Fertilized	21.0 Bu. Corn	3280 lbs. Oat Hay 2348 lbs. Pea Hay	904 lbs. Cotton	27.0 Bu. Corn	1296 lbs. Oat Hay 3098 lbs. Pea Hay	680 lbs. Cotton	Corn destroyed by Worms	800 lbs. Oat Hay	336 lbs. Cotton	360 Bu. Corn	780 lbs. Oat Hay 3860 lbs. Pea Hy
	Unfertilized	11.0 Bu. Corn	1280 lbs. Oat Hay 292 lbs. Pea Hay	280 lbs. Cotton	7.8 Bu. Corn	840 lbs. Oat Hay 2083 lbs. Pea Hay	380 lbs. Cotton	Corn destroyed by Worms	400 lbs. Oat Hay	60 lbs. Cotton	12.0 Bu. Corn	720 lbs. Oat Hay 1400 lbs. Pea Hay
PLAT 3	Fertilized	1120 lbs. Cotton	24.7 Bu. Corn; 1660 lbs. Clover 560 lbs. Pea Hay	3200 lbs. Oat Hay 3112 lbs. Pea Hay	1312 lbs. Cotton	24.4 Bu. Corn	2720 lbs. Oat Hay 3560 lbs. Pea Hay	812 lbs. Cotton	41.1 Bu. Corn	Oats failed 4500 lbs. Pea Hay	864 lbs. Cotton	17.0 Bu. Corn.
	Unfertilized	500 lbs. Cotton	13.6 Bu. Corn; 672 lbs. Clover no Pea Hay	1360 lbs. Oat Hay 1984 lbs. Pea Hay	710 lbs. Cotton	11.6 Bu. Corn	1080 lbs. Oat Hay 1980 lbs. Pea Hay	576 lbs. Cotton	25.7 Bu. Corn	Oats failed 3400 lbs. Pea Hay	668 lbs. Cotton	10.0 Bu. Corn
PLAT 4	Fert'd	1118 lbs. Cotton	980 lbs. Cotton	724 lbs. Cotton	936 lbs. Cotton	836 lbs. Cotton	664 lbs. Cotton	560 lbs. Cotton	252 lbs. Cotton	252 lbs. Cotton	252 lbs. Cotton	612. lbs. Cotton
	Unft'd	558 lbs. Cotton	204 lbs. Cotton	272 lbs. Cotton	360 lbs. Cotton	160 lbs. Cotton	52 lbs. Cotton	104 lbs. Cotton	20 lbs. Cotton	20 lbs. Cotton	68 lbs. Cotton	28 lbs. Cotton

TABLE 5—TEMPERATURES AND RAINFALL BY MONTHS FOR 15 YEARS.

	JANUARY			FEB'Y			MARCH			APRIL			MAY			JUNE			JULY			AUGUST			SEPT.			OCTOB'R			NOVEM'R			DECEM'R			
Year	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Maximum	Minimum	Rainfall	Annual Rainfall
1903					22				16.0	86	41	.05	92	48	1.38	97	54	439	98	62	11.0		66	8.0	96	50	1.65	91	36	.33	85	25	.59	78	24	47	
1904	70	22	4.0	83	29	5.0	86	33	2.7	90	42	1.6	95	52	2.6	98	63	4.7																			
1905		16	7.7		13	8.4		40	9.7	93	38	11.6		57	6.4	98	64	5.5	97	63	8.5	94	67	5.5	93	59	3.3	86	39	8.0	79	36	3.4	69	25	7.2	85.47
1906	75	25	3.5	70	29	4.5	79	28	10.6		39	2.0	94	45	3.0	99	64	5.5	95	68	5.8	100	68	3.8	95	65	10.2	85	38	.8	84	27	1.2	80	26	2.4	53.2
1907	80	28	1.2	78	30	6.3	90	41	1.2	85	30	7.0	91	49	10.9	95	54	2.7	98	68	6.1	97	66	10.5	96	60	6.0	90	38	1.3	81	28	6.6	74	27	6.7	66.5
1908	76	25	6.0	75	27	4.9	90	38	3.0	89	48	4.0	94	39	8.8	95	61	7.9	96	66	12.3	96	64	7.5	95	48	9.4	84	36	.5	82	30	1.2	80	28	1.2	66.6
1909	78	21	2.5	78	23	5.9	84	34	6.5	87	39	6.3	88	45	12.2	97	66	10.5	97	61	8.7	103	69	7.4	95	47	8.5	94	39	3.7	84	31	1.0	75	20	7.9	81.2
1910	74	22	2.8	75	23	5.1	88	30	1.0	87	36	.4	94	57	4.6	94	60	10.1	96	66	10.8	97	30	3.1	96	56	3.1	96	30	4.2	82	32	1.9	72	23	2.1	49.1
1911	81	15	4.2	80	25	2.3	90	37	5.5	85	47	11.1	98	53	2.9	99	67	6.0	93	62	8.9	97	68	6.6	98	68	8.1	93	39	4.2	81	23	3.4	74	26	6.1	69.27
1912	72	19	5.6	74	23	4.1	85	47	11.1	98	53	2.9	96	50	10.5	93	63	3.6	98	67	6.8	94	65	10.2	96	65	2.9	90	42	1.4	80	30	1.5	74	29	9.7	83.4
1913	83	31	7.8	74	27	5.3	82	30	8.9	90	39	5.1	94	50	7.5	100	56	2.9	98	67	8.9	97	65	4.0	95	47	8.9	86	34	2.5	79	30	2.3	78	30	2.5	66.6
1914	77	27	1.3	79	24	6.0	80	30	6.1	87	50	8.7	91	49	2.9	100	68	6.1	96	69	6.4	94	68	7.2	94	54	5.9	88	42	1.7	83	26	6.4	71	23	5.0	63.5
1915	71	26	7.8	73	32	6.8	76	28	1.9	91	33	.1	97	55	4.2	101	64	3.0	100	65	7.5	98	62	8.9	98	58	9.5	88	35	1.5	83	25	1.4	76	30	4.6	63.0
1916	79	25	5.3	77	21	2.7	83	30	2.5	81	37	7.0	97	54	5.8	96	55	3.0	93	67	21.8	95	63	4.8	94	47	3.4	90	36	3.0	83	25	1.4	78	25	4.4	65.1
1917	79	27	8.0	82	19	7.2	83	24	6.9	86	38	2.9	92	45	.7	98	55	1.4																				

Bulletin No. 189 December 15, 1920

CORN

AT

HOLLY SPRINGS BRANCH EXPERIMENT STATION

By C. T. Ames

Mississippi Agricultural Experiment Station
Agricultural College, Mississippi

J. R. RICKS, Director

EXPERIMENTS WITH CORN
AT THE
HOLLY SPRINGS BRANCH EXPERIMENT STATION

INTRODUCTION

For the last fourteen years experiments have been carried on at this Station with the testing of varieties of corn, different kinds of fertilizers, and best methods of soil preparation and cultivation. The results have been published from time to time in reports as well as some of the general bulletins from the Central Station. This bulletin, however, deals with results obtained within the last few years. It must be remembered, however, that the results shown in this bulletin, as well as recommendations we make, are for the Brown Loam section of Mississippi and do not apply to any other section. For instance, in our tests here the results indicate that we get good returns from the use of phosphorus, which is not the case in some other sections of the state. From our experience in growing corn for several years, we would state that to grow corn successfully on the Brown Loam soils the following methods of preparations and cultivations should be followed:

PREPARATION OF THE SOIL.—On land properly surface drained, flat preparation and level cultivation gives decidedly the best results. Fall breaking in the Brown Loam area is undesirable unless large quantities of vegetable matter are being turned under, the surface to be left rough, or land is to be seeded to a winter cover crop, such as Crimson Clover, Vetch or Rye. The roots, stalk, and rubbish remaining on the surface of unbroken land during the winter , prevents washing to some extent, whereas, soils turned, even on slightly rolling land, and left unprotected will gully in many places to the depth the land is broken.

If winter cover crops are grown, the land may be turned shortly before the desired planting time, disked, harrowed, fertilized if desired, and planted.

Soils that are broken in the fall and not planted to winter cover crops, in many instances, can be put in fine condition by double disking without re-breaking. If Vetch is used as a winter cover crop (See Holly Springs 1920 Report—"Two Year Rotation") it should be allowed to form some seed before the crop is removed or turned into the soil. This will, of a necessity, cause June planting of corn. The two crops, vetch and late corn, will be more valuable than any early spring planting of corn and the land will be richer in vegetable matter.

Where soil is inclined to be wet in the spring, the land may

be prepared in beds with water furrows not closer than every other row, which will not prevent flat cultivation and at the same time furnish proper drainage to the crop.

TIME OF PLANTING.—Early plantings have always given the largest yields as the seasons are more favorable for growth and there is no damage from bud worm on such plantings. Early in April is probably the earliest corn can be safely planted in North Mississippi under ordinary weather conditions. Rows three and one-half feet wide are considered standard, as most cultivators will cover the entire middle, whereas, in broader rows an uncultivated space will be left in the middle. The number of stalks per acre can easily be controlled by spacing in the row. A good stand of corn is necessary to heavy yields. When very early plantings are made heavy seedings are advisable. It is much easier and more profitable to have to thin corn than it is to have to cultivate land with a poor stand. The more fertile the soil, the closer the stalks can be left in the row. A good distance is from one to four feet, according to soil fertility. When more than five feet is necessary, such land should not be planted in corn. Soy beans or cow peas would be more profitable if it is necessary to use such lands for feed growing.

CULTIVATION. — With proper preparation, cultivation should be shallow and frequent. A smoothing harrow run diagonally across the rows while the corn is quite young does splendid work. This harrow may do good a few days later if run at right angles to first harrowing. After this, if the soil has become packed from lack of vegetable matter after a hard rain, a sharp tooth cultivator run three, or three and one-half inches deep will enliven the soil, and while the plants are small will do no harm. After this, frequent shallow cultivation, deep enough to make a good dust mulch, is desirable. Cultivate as soon as possible after each rain to destroy the weeds and grass while young, and check the loss of moisture, which takes place very rapidly after a crust is formed on the surface. Cultivation should continue until about the time the corn begins to tassel.

As to the kinds of tools to use, that will depend upon the weather conditions. Ordinarily, for one horse work, a side harrow, double shovel Perry, or a five tooth cultivator will do very satisfactory work. The double horse culltivator with shovel plow attachments does good work while the corn is young and the spring tooth attachment for later work. If the season is very wet, use the plow that will destroy the most grass with the least damage to the corn.

It may be seen in a following table that the prolific varieties have in most instances given the highest yields, such varieties as Cocke's Prolific, Mosby, Hastings, North Carolina Prolific, Jones Prolific, Vardaman, and Davis Poor Land corn. In the past few

years selections from the Tennessee Red Cob, such as Neal's Paymaster, Station Paymaster, and Tennessee Red Cob, a large eared type, are taking the lead.

SEED CORN.—Every farmer should, as far as possible, select his own seed, and if he finds that he has not the best variety and cannot obtain good sound seed from his own farm, he should buy his seed from some good seed breeder in his own section and not send to some distant state for it. This is particularly true of northern and western grown seed. Seed of the above mentioned varieties that have been grown and selected by a good seed breeder anywhere in the Southern States, especially east of the Mississippi River, will give good results in this section. The planting of early varieties of corn, especially where the seed have been obtained from the northern states should be discouraged. These varieties are usually low in yield, and quality of the grain is poor. Many farmers, with the idea of getting some early feed, plant these early northern grown varieties. They are only a few days earlier than some of our native varieties. Every farmer who has attempted to grow these varieties knows that they are very inferior, and as a usual thing, he never tries them the second time.

FERTILIZERS.—The use of commercial fertilizers under corn has not been a very paying investment as indicated in the majority of the fertilizer experiments conducted at this Station. Nitrate of soda, or nitrogen in some form, applied to the crop at planting time, or after first working, has given the best results, when early plantings are made on good soil. The inability of soil, deficient in humus or organic matter, to retain the proper amount of moisture is the greatest limiting factor in producing large yields. When legumes have not been grown and but little acid phosphate used on previous crops, apply from 150 to 200 pounds acid phosphate and 75 to 100 lbs. nitrate of soda, or its equivalent in other forms of nitrogen, per acre. Apply acid phosphate before seed planting and nitrate of soda after first working on top of the soil near the plants. If other forms of nitrogen are used, such as cotton seed meal, or high grade tankage, it may be applied with the phosphate before planting.

From results indicated in the fertilizer tables, it would appear that corn planted in five and one-half or six foot rows and left thick enough in the drill to make up for the extra width, and the middles between the rows planted either to soy or velvet beans, have given good results. Such a method does not reduce the yield of corn, and the beans make a better growth; this plan also gives the beans as an extra crop. Use 200 pounds per acre of acid phosphate under the beans for the best results.

Probably the most economical results are obtained, when only nitrate of soda, or some other readily available nitrogen is used. If nitrate of soda is used, 100 pounds to the acre applied at the time of planting, or at the time the corn is given its first working,

seems to give the most economical returns. However, we know that these soils are deficient in phosphorus, and applications of acid phosphate, mentioned above, usually give paying returns.

EIGHT YEAR VARIETY TEST WITH CORN

Soil—Brown Loam Valley Land.

Plots—One row plots repeated five or six times, containing from one-twentieth to one-tenth an acre each.

Fertilizer—From 300 to 400 pounds of cottonseed meal and acid phosphate mixed and applied under the seed. Two crops of crimson clover and two crops of wheat and vetch were also grown on the land during the past nine years.

NAMES OF VARIETIES	PLANTED MAY 17, 1912.	PLANTED APRIL 5, 1913.	PLANTED MAY 14, 1914.	PLANTED JUNE 14, 1914.	PLANTED APRIL 19, 1915.	PLANTED JUNE 16 1915	PLANTED JUNE 16, 1916.	PLANTED APRIL 18, 1917.	PLANTED MAY 5, 1919.	PLANTED JUNE 9, 1920.—Yield in Shelled Corn Per Acre—Bushels.	ACTUAL YIELD IN LBS. PER PLAT.	PER CENT OF SHELLED CORN PER BUSHEL.
Tennesse Red Cob	52.0		80.5	50.2	55.1	33.9	26.8	34.2	56.2	61.11	255.5	75.0
N. C. Prolific (Home Grown)		48.0	78.0		54.4	43.6	30.8					
Batt's Prolific	58.3	52.0	67.0	45.9	52.2	48.1	30.8					
Cocke's Prolific	51.2	53.9	87.0	48.7	51.2	47.3		34.7	80.4	41.86	233.0	75.7
Florida Flint	53.4	39.6	74.7	38.4	49.8	38.4	28.		62.8	45.24	241.5	72.9
Davis' Poor Land Corn	54.6	49.8	75.0	50.2	49.1	43.6						
Vardaman's Stooling Corn		57.8	79.0	53.7	48.6	42 0	23.6	31.6	67.0	34.49	210.5	84.0
Reid's Yellow Dent					46.9	34.4						
Mosby	54.0	43.0	75.5	53.5	46.8	40.9	31.8	30.2		38.72	218.5	78.5
Mosby (Woodruff's)							33.6		71.2	43.19	228.0	79.2
Alexander's 6-Ear					46.6	36.7	26.6	33.2				
Boone County White	45.5	47.1	65.5	41.0	45.8	41.4	30.4	29.6				
N. C. Prolific					43.8	49.6		33.6	67.7	34.99	217.5	82.6
Rockdale	54.0	36.7	60.8	37.0	38.4	22.9		19.7				
Goliad						46.3		33.9				
Johnson's Prolific						36.1			62.6			
Marlboro	63.0						34.4	40.5	65.7	50.20	240.0	72.2
Hickory King							30.0			49.53	217.5	73.6
Neal's Paymaster							44.0		69.2			
Ala. Expt. Sta. Yellow							30.5					
New Era			73.9	45.5								
Hasting's Prolific	51.2	47.1	77.5	47.0	45.8	47.7	25.8	32.0	61.6	42.04	207.0	77.8
Mosby (Rhodes)			83.3	43.3					66.9			
Leaming		30.5	54.4	34.0								
Munson	57.9	47.1	73.0	50.0								
E—1	56.2	49.4										
Jones' Prolific		49.4	92.2	48.1	46.2	46.7	38.2			39.95	237.5	76.4
U. S. D. A. No. 195								34.2				
Williamson								47.3				
Johnson County White								38.4		46.99	236.0	75.7
Jones' Vardaman									60.4	39.99	236.5	84.0
Simmons' Prolific								65.7		49.07	230.5	73.6
Ferguson's Yellow Dent								44.0				
Sure Cropper								70.1				
Giant Tennessee Red Cob								87.5				
Paymaster (Station)								73.7		51.92	249.5	79.9
Mosby — 553										41.61	217.5	77.8
Paymaster (Harpeth)										61.63	275.0	73.6
Tennessee Red Cob—72										57.60	242.5	72.2
Garric										46.43	223.0	67.4

FERTILIZER UNDER CORN. 1917.

Soil—Brown Loam Table land.

Plots—Six rows, each 92 feet long and four feet wide, making one-twentieth of an acre.

Planted to Mosby corn, April 24, 1917.

Number.	Bushels per acre.
1.—200 pounds Acid Phosphate	16.6
2.—Check	15.5
3.—200 pounds Cottonseed Meal	24.1
4.—200 pounds Kainit	17.7
5.—Check	15.5
6.—200 pounds Basic Slag	14.7
7.—200 pounds Tenn. Phosphate Rock	15.8
8.—Check	11.4
9.—100 Cottonseed Meal 100 pounds Acid Phosphate	24.1
10.—100 pounds Cottonseed Meal 300 pounds Acid Phosphate	23.0
11.—Check	15.4
12.—200 pounds Acid Phosphate 200 pounds Cottonseed Meal	25.8
13.—300 pounds Tenn. Phosphate Rock 100 pounds Cottonseed Meal	17.5
14.—Check	20.0
15.—200 pounds Cottonseed Meal 200 pounds Basic Slag	14.7
16.—100 Cottonseed Meal 300 pounds Acid Phosphate	16.4
17.—Check	11.4
18.—300 pounds Cottonseed Meal 300 pounds Acid Phosphate	16.1
19.—300 pounds Acid Phosphate 300 pounds Kainit	17.5
20.—Check	20.0
21.—300 pounds Acid Phosphate 300 pounds Kainit	14.7
22.—400 pounds Cottonseed Meal	15.5
23.—Check	11.4
24.—2000 pounds Crushed Limestone	12.7

REMARKS.—The season was unfavorable, which is usually the case on comparatively thin land. In the arrangement of table it was necessary to repeat check plots, as every fifth plot was used in planting.

CONCLUSIONS.—Large applications of fertilizer a dry year will not insure a large yield, when used on thin land. Two hundred pounds of cottonseed meal gave good results, also a mixture

of 100 pounds of cotton seed meal and 100 pounds acid phosphate.

The limiting factor unquestionably was the lack of the proper amount of moisture. Such land, if possible, should be seeded in velvet beans early in the spring, using 200 pounds acid phosphate under the beaus. In the early fall these beans should be either grazed off or turned under and land then seeded to either hairy vetch or crimson clover. If planted to corn after this crop, it will yield enough to make up for the year lost in corn.

FERTILIZER TEST WITH CORN AND BEANS. 1919.

Soil—Brown Loam valley land from which had been harvested a crop of wheat and vetch, shortly before seeding to corn.

Plots—Six rows each, four feet wide and 235 feet long, making one-eighth of an acre. All rows four feet wide unless otherwise stated.

Planted—June 28, 1919.

Number	Bushels per acre.
1.—Corn and soy beans in same row	35.6
2.—Check	39.2
3.—Corn and velvet beans in same row	32.1
4.—Corn in 6 ft. row with soy beans between row	39.2
5.—Check	38.1
6.—Corn in 6 ft. rows, velvet beans between rows	36.7
7.—Corn, 100 pounds nitrate of soda after first working	48.2
8.—Check	38.1
9.—250 pounds cottonseed meal at planting	44.1
10.—250 pounds acid phosphate	41.5
11.—Check	38.1
12.—250 pounds cottonseed meal at planting	47.3
13.—250 pounds cottonseed meal 250 pounds acid phosphate	47.7
14.—Check	41.1
15.—250 pounds cottonseed meal 250 pounds acid phosphate	44.4

REMARKS.—It was the intention that all plots, including those with six-foot rows, should have the same number of stalks per acre.

In the arrangement of the above table it was necessary to repeat two of the check plots, as in the planting each fifth plot was a check.

CONCLUSIONS.—Nitrogen gave the best results. As may

be seen, 100 pounds of nitrate of soda applied after first working, gave an increased yielld of ten bushels per acre.

It would also appear that corn planted in 5 1-2 to 6 ft. rows, using the same number of stalks per acre as for narrow rows, and planting a row of velvet or soy beans between the rows of corn, does not decrease the yield of corn. Such a method would give an additional crop of beans on the land which almost every acre in the South sorely needs.

CORN FOR SILAGE

The principal silage crop in the South is corn. Such varieties as Goliad, Mosby, Cocke's Prolific, and Hastings are tall growing and give good yields. Of these varieties we would especially recommend Goliad, since it usually produces anywhere from 10 to 30 per cent more in tonnage than the other varieties. For the past three years, this Station has discarded the use of corn as silage entirely, and is now growing Japanese seeded ribbon cane. On this land this sorghum will stand much more drouth than corn and produce greater tonnage. On good land, after a crop of crimson clover, where the corn grew thirteen feet tall, it only produced twelve and one-half tons of silage per acre, whereas, sorghum on similar soill would have produced from 15 to 16 tons per acre. In feeding tests at the Central Station, it was determined that there was something like fifty cents per ton difference in feeding value in favor of corn. With this small difference, and a considerable increase in yield and a much surer crop on either thin or fertile soil, why grow corn for silage at all? In using sorghum for silage, the cane must be full ripe, that is, ripe enough for syrup; otherwise it makes a sour silage, an undesirable feed. Corn and sorghum mixed make a good silage. Corn and sorghum may be planted in alternate rows with success on fertile soils.

It must be remembered, however, that by growing sorghum on the same land continuously, the fertility of the soil is reduced rapidly and in a few years even sorghum growing on the same soil would be unprofitable. It is usually conceded that sorghum will reduce the fertility of the soil more rapidly than corn. In growing either crop for silage it will be necessary to add liberal amounts of barnyard manure, or else grow some cover crop, like vetch and oats, or crimson clover to be turned into the soil in order to keep up the fertility. In this section this can be done. As soon as the crop is off in the early fall, the land must be immediately prepared and planted to a winter cover crop, which may be turned into the soil as early in the spring as the maturity of such crop justifies. By this is meant, if the crop should be crimson clover, it is ready to be turned into the soil when it is in full bloom, which is usally about the first of May. If vetch and oats, or vetch and some other small grain are used, the time for turning under

will be about two or three weeks later, or about the time the first vetch seed are ripe as indicated on the first page of this bulletin. By following this system, one can continue to grow these silage crops for several years, provided that some acid phosphate has been applied to the soil. Where a good deal of barnyard manure is used, and where a large amount of these cover crops is turned under, rock phosphate will give good results. By using rock phosphate in larger quantities than acid phosphate, it will be unnecessary to add this material oftener than four or five years.

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DISEASES OF THE SWEET POTATO IN MISSISSIPPI AND THEIR CONTROL

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Diseases of the Sweet Potato in Mississippi and Their Control

By
D. C. NEAL.

Sweet potatoes are rapidly growing in importance as a commercial crop in Mississippi. The production during 1919 totaled approximately 10,300,000 bushels. The yield for 1920 will doubtless exceed this figure. On the basis of these estimates, Mississippi ranks fourth in sweet potato production being excelled only by Alabama, Georgia, and perhaps Texas.

The profits to be gained from such a crop would no doubt be greater if it were not for the numerous diseaes to which the plant is subject. The total losses in 1919 as the result of disease attacks is conservatively placed at 40 per cent. Data collected for the State this season (1920) indicates that similar losses will be slightly in excess of 1919. When such a high percentage of loss is added to the actual yield for the State (10,300,000 bushels), one gains some idea as to the inroads made by diseases.

In order that the growers in the State may familiarize themselves with the principal sweet potato diseases, and be able to combat them intelligently and effectively, these are summarized herein, symptoms outlined, and methods of control presented so far as known.

THE TWO CLASSES OF SWEET POTATO DISEASES.

Sweet potato diseases may be divided into two classes, (1) field diseases attacking roots, stems, and leaves, and (2) storage rots. Both groups are important and many of each occur in Mississippi. Field diseases of stems and roots will be taken up separately and discussed first. These include black-rot, stem-rot, foot-rot, scurf, sclerotial-rot, Texas root-rot, and soil-rot.

FIELD DISEASES OF STEMS AND ROOTS.

BLACK ROT.

Economic Importance.—Black-rot is by far the most serious disease of the sweet potato in Mississippi. This disease is no doubt responsible for at least 10 or 12 per cent of all losses encountered in growing, harvesting, and marketing the crop. It is widely distributed over the State, and is perhaps present to a greater or less extent wherever the crop is grown. In addition to being a serious field disease, it is also often present in the seed bed, causing the death of many sprouts and infecting others. If sprouts are set to a field affected with black-rot (black-shank), two serious consequences invariably result. First, the infected plants will produce wholesale soil infection, and the land is rendered unfit for growing potatoes; second, the disease is transmitted to the roots, and black-rotted potatoes will be harvested.

Symptoms.—Black-rot may occur on any of the underground portions of the plant. On the sprouts, it usually begins at the base just beneath the soil line. Here the disease manifests itself as small spots varying from dark-brown to a lamp-black color. These gradually enlarge, extend up the stem, and it is here that we get the stage known as "black-shank" (See Fig 1). In many cases the plants in the seed bed and the field are often rotted off at the base by the shank stage of the fungus. On the roots, the disease is very typical. Here it produces circular, dark to olive-brown colored spots (See Fig. 2). These infected areas vary in size from small to large spots, which may cover more than one-third of the surface of the potato. Sweet potatoes infected with black-rot are very bitter in taste, and this feature alone is very helpful indeed when one is in doubt as to its presence.

Cause.—Black-rot is caused by the fungus *Sphaeronema fimbriatum* (E. & H.) Sacc. It is a disease of the underground portions of the plant. The

fungus produces several types of spores, and experiments have shown that it can overwinter on diseased vines and tubers left in the field. Infection develops through the roots, either originating from infected soil after the plants

Fig. 1. Black-rot, or black-hank, on sweet potato plants. Note the characteristic blackening at base of sprouts.

are set in the field or developing on plants in the seed bed growing from diseased potatoes. Frequently, plants becoming infected with black-rot in the seed bed die before transplanting. As a rule, however, countless numbers withstand the shank infections, and the disease continues to grow on them. The diseased sprouts are oftentimes set to the field, and the infection is thus transferred to the roots which form on the diseased plants. At harvest the tubers are black-rooted, and when these are placed in storage, the trouble continues to spread and infects healthy surrounding stock.

CONTROL.

Seed Selection.—Careful seed selection in order to insure healthy stock is of primary importance in controlling such diseases as black-rot. If black-rotted potatoes are bedded, the sprouts produced therefrom will almost invariably have black-rot, or "black-shank," as this stage of the disease is sometimes called. As mentioned above, such practice not only serves as a source of infection to the new crop, but the soil is rendered unfit for the growing of sweeet potatoes, since the fungus is able to live over in the field on diseased potatoes and vines. Before preparing the beds in the spring, the sweet potato seed-stock should be carefully selected, taking care to discard all potatoes having the slightest trace of black-rot or any suspicious spots. All discarded potatoes should be distroyed in some manner, and in no case should they be

thrown indiscriminately around the beds. These may be boiled and then fed to stock or else buried in some remote place.

Seed Treatment.—After the potatoes have been carefully selected, they

Fig. 2. Sweet potato black-rot. Sweet potatoes showing the dark, circular spots produced by the black-rot fungus.

should be treated with a solution of corrosive sublimate, made by dissolving 1 ounce of the poison in 8 gallons of water. This kills any surface spores or germs that may be present. The seed potatoes should be treated in this manner for 10 minutes. When large quantities of seed are to be treated, large stocks of the solution may be prepared in barrels or wooden tubs (Fig 3). Never use zinc or metal containers for this purpose, since the corrosive sublimate solution corrodes such materials. The potatoes may be placed in sacks or hampers and suspended in the solution, being careful to see that all sides of the potatoes are thoroughly wetted with the liquid. It is, perhaps, more convenient to treat not over a bushel at a time; the same corrosive sublimate solution, however, may be used over again for treating several lots of seed. This disinfectant may be obtained from any drug store at a nominal price. It must be remembered that corrosive sublimate is a deadly poison when taken internally, hence, it should always be handled so that chickens or stock cannot drink from the containers having the poison. It is harmless, however, to the skin or clothing and may be handled with perfect safety. After

the potatoes have remained in the solution 10 minutes, they may be removed and immediately bedded. No rinsing or removal of the poison is necessary.

Seed Bed Sanitation.—The fungus causing black-rot not only reaches the

Fig. 3. Seed treatment of sweet potatoes. 3. Method of corrosive sublimate treatment in half barrels. 4. In wooden tank specially prepared. (After B. F. Brown, Extension Division, Texas A. and M. College.)

seed bed by being carried there on infected seed, but experiments clearly show that it will live over in the soil of the seed bed or in other soils where infected plants have been grown. The practice, therefore, of using the same seed-bed from year to year should be abandoned. The soil in the seed-bed should be changed

each year and should be taken from places where sweet potatoes have never been grown. A better plan is to change the location of the seed-bed each year. In case it becomes necessary to use the old framework again, this should also be disinfected with copper sulphate (blue-stone) solution at the rate of 1 pound to 25 gallons of water, or else use a solution of formalin in the proportion of 1 pint to 30 gallons of water. Pure sand may be used in the seed bed; rich soil or fertilizers are not essential, and manure should be avoided as this often encourages black-rot.

Crop Rotation.—The fact should not be forgotten that the black-rot fungus is a disease which is capable of over-wintering in the soil on diseased roots and other organic materials. It is not definitely known how long the fungus will remain viable in infected soil. Nevertheless, fields which are badly infected should be given a period of rest, and such ground should not be planted to sweet potatoes oftener than once in three or four years.

STEM ROT OR WILT.
(Yellow Blight or Blue Stem.)

Prevalence and Distribution.—Stem-rot or wilt is becoming established in many sections of the State. Specimens have been received this year from the following counties: Lee, Marshall, Prentiss, Chickasaw, Pontotoc, Oktibbeha,

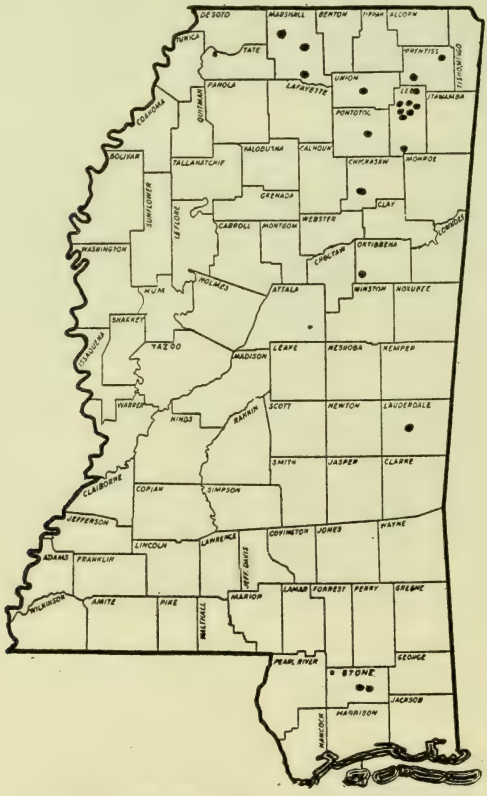

Fig. 4. Map showing distribution of sweet potato stem-rot in Mississippi by counties.

Union, Stone, and Lauderdale. See diagram (Fig 4). No doubt much of the infecton now reported has been introduced on sprouts from localities where the disease is prevalent. This is one of the ways by which stem-rot is disseminated. In some states, this disease is often responsible for a reduction in yield of 50 per cent, especially is this true in New Jersey, Deleware, southern Illinois, and other states. According to Harter (1), stem-rot is responsible for a loss of at least three-quarters of a million dollars annually to the sweet potato crop in the United States. It is, like black-rot, a seed bed and field disease, but unlike the latter, it does not spread in storage.

Symptoms.—Infected plants ordinarily show a rather distinct difference in the color of the foliage as compared with healthy plants. As a rule, the leaves of the plants reveal a decided yellowing along the veins, the younger or terminal leaves becoming first involved, and then the whole vine, giving the plant a dull, pale-yellow appearance. Wilting follows quite rapidly, especially during a dry

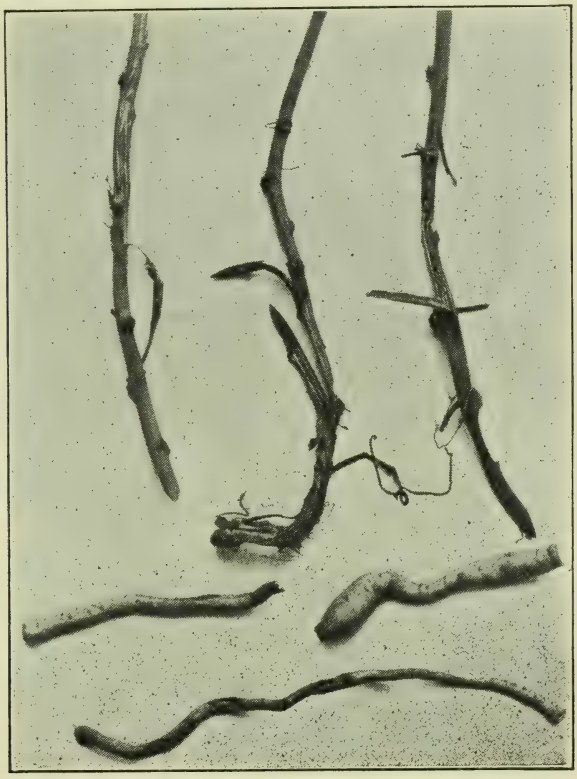

Fig. 5. Sweet potato stem-rot. Note the blackened condition of the inner portions of the stems of the plants, caused by the stem-rot fungus. Below are types of potatoes frequently produced.

season, and the plant soon dies. During wet weather, the infected plants appear stunted but are able to survive for long periods before succumbing to the disease. If one examines a plant infected with stem-rot by splitting open the stem near the base of the hill, it is always found to be blackened inside (Fig. 5).

Frequently this may extend throughout the stem and into the roots, causing the tubers to become infected. (Fig 6.) Occasionally a diseased plant will produce a few potatoes, but they are very small, stringy, and of no market value.

Fig. 6. Showing invasion of stem-rot fungus of sweet potato into the roots. (Photographed by C. W. Edgerton, La. Exp. Station.)

Cause—The cause of sweet potato stem-rot is two species of fungi known as *Fusarium batatatis* Wr. and Fusarium *heperoxysporum* Wr. These fungi are quite similar morphologically to Fusarium wilts of tomatoes, cowpeas, and cotton. The sweet potato stem-rot organisms, however, are not known to attack any other plant. Infection takes place through the root of the plant, and the fungus gradually works its way to the water passages of the stems and branches. Here excessive growth of the organism plugs the water ducts, and this inhibits water from passing upward to the vines and leaves. Wilting results and causes the yellowing of the vines as heretofore discussed. The disease occurs both in the field and in the seed bed. Field infection develops either from placing healthy plants on ground already infected, or it may arise from transplanting sprouts which have become diseased in the seed bed.

Control—Such preventive measures as seed selection, seed-bed sanitation, and crop rotation as given for black-rot, also apply in the case of stem-rot. Growers should, also, make a practice of growing and selecting their own plants or else purchase them from localities where stem-rot does not occur. In selecting seed potatoes free from stem-rot, it is well to carry out the operation in the fall at digging time. By splitting the stem of each hill near the base, stem-rot is easily detected, the tissues inside being streaked with black. Potatoes from such hills should not be used for seed. Seed treatment is of no value in controlling stem-rot, since the disease is confined to the vessels of the potatoes, and no disinfectant can reach it. Where land is already infected, crops other than sweet potatoes should be planted in order to starve out the disease.

FOOT ROT.
(Die-off.)

Economic Importance.—Foot-rot does not occur to any extent in Mississippi, and at present is of very little economic importance in the State. It is a destructive disease of sweet potatoes in Virginia and has been studied there by Harter (2) and McClintock (3). It is also known to occur in New Jersey, Maryland, Ohio, Missouri, Kansas, California, and Florida.

Symptoms.—Foot-rot, as the name indicates, first manifests itself as dark brown to black areas at the foot of the stem of the plant, as shown in Fig. 7. These diseased areas may extend up the vine 5 or 6 inches, finally girdling the

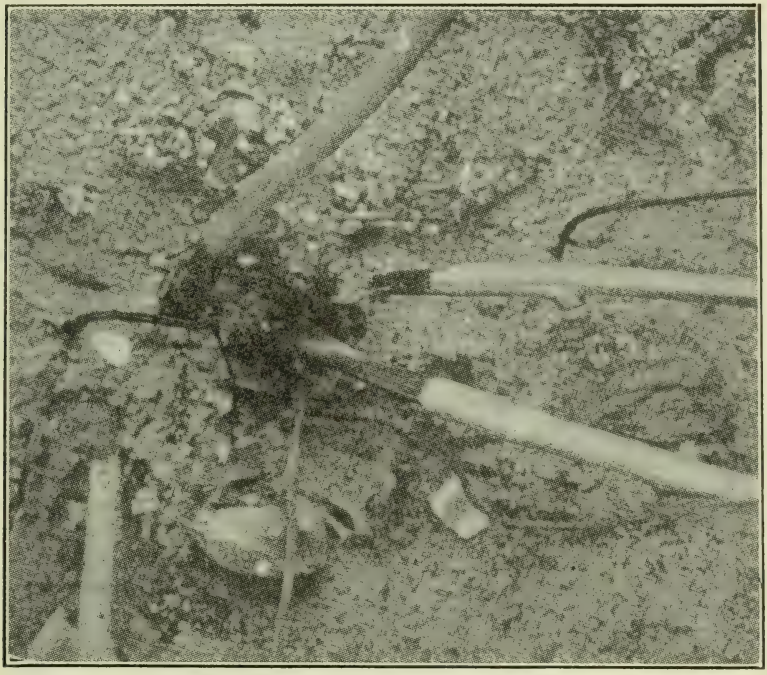

Fig. 7. Sweet potato stems infected by the foot-rot fungus. Note the dark brown, shrunken area at base of stems. (After J. A. McClintock, Va. Truck Exp. Station, Bulletin 22.)

Fig. 8. A sweet potato infected by the foot-rot fungus. Note shrinkage of the diseased tissues. This is characteristic of foot-rot. (After J. A. McClintock, Va. Truck Exp. Station, Bulletin 22.)

plant. The progress of the disease is somewhat slow, and as a rule, affected plants do not begin to die until late in the summer. Occasionally sprouts of the diseased plants may withstand the attack of the fungus for a time, with the result that a few potatoes may be produced, but these are invariably affected with the disease at harvest time. (See Fig 8). The causual fungus is *Plenodomus destruens* Hart.

Control.—Since foot-rot is disseminated largely by means of contaminated seed, plants, and vines, the same preventive measures of seed selection, clean seed beds, and crop rotation as already mentioned on pages 3 to 6 should be employed.

SCURF.

(Soil Stain.)

Economic Importance.—Scurf, or soil stain, is a very common sweet potato trouble in many parts of the State. The writer has received a number of specimens affected with the disease the past season. It also occurs widely in other states where the crop is grown. It does not produce a rot of the potatoes but causes a discoloration of the skin. As a result, the potatoes do not have an attractive appearance and command a lower price on the market. Because of the superficial nature of the disease, however, scurfy potatoes are used for food to a great extent; and if no other diseases are present, their edible quality is unaltered. Scurf is responsible for shrinkage in storage. It injures the epidermis of the potato so that there is a considerable loss of moisture.

Symptoms.—Scurf is doubtless familiar to most growers. It is characterized by the formation of brownish spots scattered over the surface of the potato. These may be small, circular, or irregular, and sometimes coalescing to form a continuous discolored area. (Fig. 9.) In severe cases the entire surface

Fig. 9. Scurf, or soil stain, of sweet potato. Note the spots and coalescing discoloration caused by the scurf fungus.

may be covered. On the white-skinned varieties, it is particularly noticeable. The discolored or infected areas are, for the most part, present in the field before the crop is harvested, though they may enlarge slightly in storage, and possibly a few new ones may be formed.

Cause.—The cause of scurfy sweet potatoes is a fungus known as *Monilochaetes infuscans* Hals. The fungus affects only the skin of the potato, and is so superficial as to be readily scraped off by the finger nail. The fungus causing scurf, like several other field diseases of sweet potatoes, is largely carried to the field on the sprouts. From these it reaches the roots, and in this manner is spread to the new crop. The fungus lives through the winter on the potatoes in storage and on the decayed vines in the field.

Control.—Scurf may be controlled by treating the seed potatoes with corrosive sublimate, as indicated on page 4. In addition, healthy seed, clean soil in the beds, and crop rotation should be employed. The disease is worse on low, poorly drained soils and on soils heavily manured. Such land should be avoided.

SCLEROTIAL ROT.

(Blight or Wilt.)

Prevalence.—A number of sweet potato beds were examined by the writer the past spring in the southern part of the State, and in many instances a rather high percentage of plants were found to be infected with a disease known as sclerotial-rot. This trouble, also called blight, wilt, or crown rot. sometimes produces a serious injury to the plants in the beds.

Symptoms.—Sclerotial-rot is characterized by a rotting of the plant stem just at, below, or above the surface of the ground. At the base of the stems and the ground around them for a distance of 2 or 3 inches, the disease produces a moldy, white growth. This moldy growth usually develops numerous hard, round bodies, called sclerotia, about the size of a mustard seed. These may be white at first but later become yellowish, then brown, and finally black when old. Sclerotial-rot is caused by the fungus *Sclerotium rolfsii* Sacc.

Control.—The disease is seldom serious enough to warrant the use of control measures. Occasionally, in beds which are poorly drained and where the plants are growing crowded together, it may cause some damage. Very little injury should result where good seed-bed practice is used.

TEXAS ROOT-ROT.

Economic Importance—Texas root-rot, so far as known, has not as yet been found in Mississippi. In Texas this disease commonly occurs, and is often destructive to sweet potatoes there. It is said to be worse in that State on the black, poorly drained soils, and during periods of wet weather. Root-rot enters the plants on the underground parts, and may spread deep into the roots or extend upward for a few inches into the stems and vines. Occasionally a slight yellowing and unhealthy appearance of the leaves are noted, which may be accompanied by wilting. The disease enters the potatoes, producing spots, which finally results in a firm, shrunken brown rot. Texas root-rot also attacks cotton, alfalfa, cowpeas, and certain orchard fruits.

Cause.—Root-rot is caused by the fungus *Ozonium omnivorum* (Pam.) Shear. The organism lives by means of hyphae, from one season to the next in the soil on decayed roots of sweet potato, alfalfa, etc. The fungus produces only sterile mycelia, or hyphae, although Duggar (4), reports the presence of a fruiting stage, which he calls *Phomatrichum omnivorum* (Shear) Dug, or the fruiting stage of *Ozonium omnivorum.* According to Taubenhaus (5), the Texas root-rot fungus is a sterile organism, and overwinters from year to year as sterile mycelium on dead roots of sweet potatoes and other plants.

Control.—Because of the great variety of plants attacked by root-rot, it is difficult to control. Since the disease is more prevalent on heavy, alluvial soils, such land should not be used for planting. A thorough system of rotation is also necessary, and in addition to sweet potatoes, this should also preclude the planting of such crops as cotton, okra, and alfalfa for several years. Grain crops are not affected by the disease, and may be planted.

SOIL-ROT.

(Pox or Pit.)

Economic Importance.—Soil-rot, perhaps better known as "pox" or "pit," is another important field disease of sweet potatoes. The writer has not as yet however, any evidence of the disease existing in Mississippi,, and at present it

Fig. 10. Soil-rot of sweet potato. Also known as "pox" or "pit," showing the characteristic spots produced by the fungus on the root. (After Taubenhaus.)

is of no economic importance. In Deleware, Texas, and other states, it is considered a serious disease of the crop. Reduction of yields and the formation of ill-shaped potatoes are the important effects of this disease.

Symptoms.—Soil-rot attacks the roots, and at harvest infection may be observed frequently near the middle of the potatoes in the form of dark, round, roughened spots on the surface. After the potatoes are harvested and placed in storage, the infected areas may become dry and fall out, thereby assuming a pitted or pox-like appearance (Fig 10). The feeding roots are also frequently entirely destroyed. According to Elliott (6), soil-rot is caused by a slime mold, *Cytospora batatas*, Elliott.

Control.—At present very little data are available as to remedial measures for soil-rot; yet Taubenhaus states that the disease is not carried with the sweet potatoes, and after the pox spots dry and drop off, as is the case in storage, such potatoes when used for seed will produce healthy plants. It is probably advisable to treat (See page 4) soil-rotted seed as a precaution against other diseases that may be present. Soil-rot also attacks Irish potatoes, beets turnips, and perhaps tomatoes (7). Hence, it becomes necessary in the case of infected soils not to plant these crops thereon, as well as sweet potatoes, for at least three or four years.

LEAF DISEASES.

Occurring in nearly every sweet potato growing district are three leaf diseases of sweet potatoes. These are leaf-blight caused by the fungus Phyllosticta batatis Taub., leaf spot caused by the fungus *Septoria bataticola* E. and M., and white-rust caused by the fungus *Albugo ipomeae-panduranae* (Schw.) Sw. All of these troubles produce more or less spotting of the foliage, but because of their minor importance they will not be discussed here.

STORAGE-ROTS.

A conservative estimate of the percentage reduction from the normal yield of sweet potatoes in Mississippi as the result of storage-rots is fully 25 or 30 percent. There is no doubt but that growers in the State would be able to market a much greater quantity of sweet potatoes if the losses resulting from storage-rots could be reduced to a minimum.

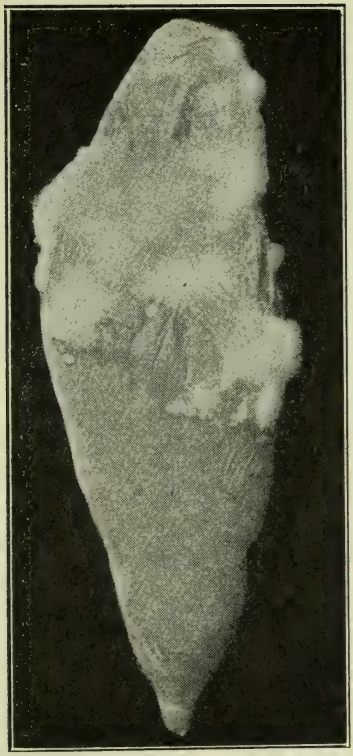

Fig. 11. Soft-rot. A sweet potato showing the moldy growth produced by the soft-rot fungus. (After Taubenhaus.)

SOFT-ROT.

Economic Importance.—In a number of sweet potato storage houses which lose heavily from rots, most of the loss may be attributed to soft-rot. It is doubtless the most prevalent and destructive of the storage-rot organisms.

Symptoms.—Soft-rot, as the name implies, cannot be mistaken for any other disease; it produces a soft decay of the potatoes. It may start at either end of the potato and in the presence of high humidity and high temperature, the latter becomes soft and mushy (Fig. 11). In a few days, the entire potato may be totally destroyed. Soft-rotted potatoes soon lose their moisture and become hard and brittle. Growers frequently call this stage "dry-rot," whereas it is merely the after effects of soft-rot.

Cause.—The common bread mold, *Rhizopus nigricans* Ehr., is the fungus causing soft-rot. It abounds everywhere, growing readily in damp places, and on various decaying substances. Hence, it is almost impossible to exclude it from the storage house. If the skin of an infected potato is broken while soft and watery, the fungus may form a luxuriant, moldy growth (mycelium) on the surface. This is seen at the top of Fig 11. The organism usually gains entrance to the potato through wounds on the surface or at the ends where it was detached from the vine. Frosted potatoes also invariably develop soft-rot. The fungus produces spores in abundance, and these may be easily scattered in the bins and to other parts of the house by such agencies as flies and gnats, and by handling the potatoes. If sufficient moisture is present and the temperature is high, the spores continue to spread the disease.

RING ROT.

(Collar-Rot.)

Ring-rot is often encountered in the storage house. It is caused by the same mold (*Rhizopus nigricans*) that produces soft-rot, but differs from the latter in that the decay begins at a point between the ends rather than at the ends. The infection starting at such a point often forms a ring or collar around the potato, and may at the same time progress slowly toward the ends. Decays of this nature are sometimes retarded in growth by unfavorable conditions,

such as low temperature and low humidity, and instead of engrossing the entire potato, merely a ring or collar is formed (Fig 12.)

Fig. 12. Ring-rot of sweet potato, a type of rot often encountered in the storage house.

BLACK-ROT.

Black-rot caused by the fungus *Sphaeronema fimbriatum* (E. & H) Sacc., has already been discussed under field diseases (See page 2). It also constitutes one of the major storage-rot troubles, being probably second in importance to soft-rot. Frequently sweet potatoes are placed in storage that are slightly infected with tiny almost invisible black-rot spots. Under conditions of high temperature and humidity, these spots may gradually enlarge and form the dark, round spots on the potatoes as indicated in figure 2. The fruiting bodies (pycnidia) are produced near the center of the spots, and in these the spores of the fungus are produced. These are finally discharged and may be disseminated to other potatoes, in which the rot may develop again if conditions are favorable.

Fig. 13. Java black-rot. A sweet potato decayed by the Java black-rot fungus. Note the numerous domelike fruiting bodies of the fungus on the surface.

MINOR STORAGE-ROTS.

There are other diseases such as Java black-rot (caused by the fungus *Diplodia tubericola* (E. and E., Taub.) (Fig. 13), dry rot (*Diaporthe batatatis* (E. and E.) Harter and Field (Fig. 14), and charcoal rot (*Sclerotium bataticola*

Fig. 14. A sweet potato infected by the dry-rot fungus. Note the dry, shrunken appearance.

Taub.), which may attack the sweet potato in storage. These are, however, usually secondary and follow primary infections of black-rot and soft-rot; and because of their minor importance detailed discussion concerning them is here omitted.

Control of Storage-Rots.—To control the principal storage-rot organisms, which have been mentioned above, it is first essential for the grower to equip himself with a modern storage house.* Scarcely any degree of success can be had unless this is available. In addition to a well regulated system of storage, there are other factors necessary for successfully controlling storage-rots. These are summarized as follows:

1. Eliminate the field diseases as far as possible by the control methods already mentioned. Some of these, like black-rot, also spread in storage while others, as stem-rot and foot-rot, may induce storage-rot organisms to enter the potatoes.

II. Dig the potatoes during bright clear days just before frost, and allow them to dry thoroughly in the sun. It is advisable to begin digging operations a few days preceding a heavy frost; heavy frosts may injure some of the potatoes, and these are difficult to keep in storage. During harvesting, avoid bruising and otherwise injuring the potatoes as much as possible, since bruised surfaces afford an entrance for soft-rot and other storage-rot organisms.

III. After the potatoes have been dried in the sun, as much as weather conditions will permit, place them in clean, open crates and remove to the storage house. Storing in crates is preferable to storing in bins, since with the former the potatoes have better ventilation, become less bruised than when dumped into bins, and are much easier to handle when ready for market.

IV. Storage houses in which potatoes were stored the previous year should always be thoroughly disinfected before receiving the new crop. Unless

*Plans for the construction of sweet potato storage houses may be obtained from the Extension Division, Miss. A. & M. College, or the Bureau of Markets, U. S. Department of Agriculture, Washington, D. C.

this is done, the potatoes may come in contact with spores of the various soft-rot organisms remaining from last season. After houses have been cleared of all rubbish and other debris, they should be sprayed down with a suitable fungicide, such as copper sulphate, formalin, or lime-sulphur. Copper sulphate may be used at the rate of 1 pound to 25 gallons of water, or formalin in the proportion of 1 pint commercial formalin to 30 gallons of water. Good success is often attained by merely white-washing the houses, but such a disinfectant is perhaps more effective if a winter-strength solution of lime-sulphur is added.

V. After the above mentioned suggestions have been followed, success in curing potatoes properly and preventing the development of storage-rots depends finally upon the management of the storage house. During the first two weeks of curing, the temperature of the storage house should be high, namely, from 80 degrees to 85 degrees F. This aids in curing the potatoes and dries off surplus moisture. The ventilators should be handled so that the moisture given off by the potatoes is carried out of the house. After ten days or two weeks of curing, the temperature of the house should be gradually lowered to 50 degrees or 55 degrees F, and this maintained as far as possible during the remainder of the storage period. The main plan is to keep the house dry and as near 50 or 55 degrees F as possible. During the cold months the house should be carefully watched as to temperature and humidity conditions. if moisture accumulates, this must be gotten out of the house by opening the ventilators at the top and admitting dry air from below.

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The Mosaic Disease of Sugar Cane in Mississippi in 1920

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Agricultural College, Mississippi

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DIRECTOR

THE MOSAIC DISEASE OF SUGAR CANE IN MISSISSIPPI IN 1920

By L. E. MILES, Plant Pathologist.

STATE PLANT BOARD OF MISSISSIPPI

During the last few years a malady known as the mosaic disease, has occasioned severe losses in the sugar cane industry in Porto Rico. It was first noticed there about the middle of 1916. It is not a new disease, however, as it was recognized as an undesirable condition in sugar cane as early as 1890 by the Dutch in Java. It is also present in Cuba and Argentine, but was not recognized in this country until July, 1919, though it has evidently been here for a considerable number of years. At that time it was found by a Government agent that the river district in Louisiana was already severely infested, and at the present time it has already become one of the most serious problems with which the cane growers in that state have to deal.

After its discovery in Louisiana the various state authorities were immediately notified of its importance, and a survey of the Gulf States was made by Government scouts to determine the location of all infected areas, and, if possible, to trace the original importation and the course of its subsequent spread. The disease was located in Louisiana, Florida, Georgia, Alabama, and Mississippi, but was much more abundant in Louisiana than in any of the other states, as was naturally to be expected, considering the far greater size and proximity of the sugar cane fields. In some sections of that state near the Mississippi river, where it has been present for a number of years, nearly one hundred per cent of the cane is affected.

In the other states in which the disease is known to occur, sugar cane growing is mostly on a small scale, consisting usually of patches of only a few acres, or even of fractions of an acre, and is grown for syrup making only. In Georgia the only infections were located in one country, Grady County, but in Florida they were rather widely distributed over the state, due to the distribution of cuttings from experimental plots grown for the purpose of testing varieties. In Alabama and Mississippi infections were located at one point only in each state, the one in Mississippi being at Biloxi. The Government agent reporting it states that at that time it had spread from the farm on which it first appeared to one other farm in the vicinity.

The disease was originally introduced into this country, in all probability, through the Sugar Experiment Station of the Louisiana State University, at Audibon Park, which made a custom of importing new varieties with a view to obtaining some higher in sugar content and yield than those already grown here. In introducing these varieties, the disease was, of course, rather widely distributed before its nature was known. No particular blame should fall upon this institution or upon any private individual who was connected with its introduction as the disease is quite obscure and apt to be overlooked, there being only one variety, so far as known, in which it can be positively identified on the cuttings or on the seed cane after the leaves have been removed.

SYMPTOMS OF THE MOSAIC DISEASE.

The first symptom observed in plants affected by the mosaic disease is a general pallor of the leaves, which may be discernible for several rods. Closer

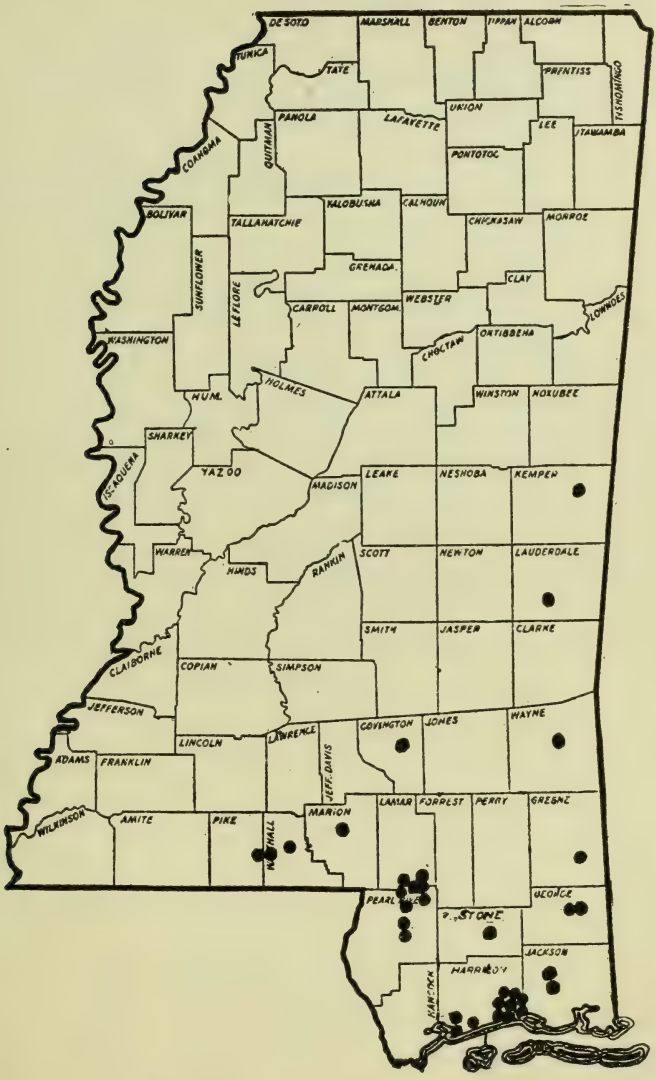
examination reveals that the pallor is due to irregular, light-colored streaks or spots on the leaves. In color the affected leaf areas are of two types. In the most common type the pale portion presents a "washed out" appearance, and is merely a dilution or a tint of the normal color. In the second type the pale spot presents a decided yellowish green appearance, though the normal and affected parts are always sharply delineated in either case. There is no gradual blending of colors in either type. Great diversity of patterns occurs in the different varieties due to the variation in the amount, size, and shape of the light colored areas, but in any particular kind of sugar cane, the arrangement is always quite constant.

In the youngest leaves of the ordinary varieties of cane grown in Mississippi the light areas are in the shape of alternate streaks, varying greatly in size but never continuous throughout the length of the blade. In general they are isolated from one another and are distributed uniformly over the leaf surface. When a leaf of the sugar cane is affected by the mosaic disease it is affected throughout its entire length from base to tip. The amount of normal colored tissue greatly exceeds the light tissue in the younger leaves, but as the leaf matures the light-colored areas, by becoming confluent predominate and it takes on a pallid or even yellowish appearance. The dark green, or normal, areas become quite scant and appear as elongated streaks in the pale green, a condition exactly the reverse of that in the young leaves, except that the dark green areas are less regular in outline.

In tropical countries where the cane is allowed to ratoon over a number of years secondary symptoms arise which are not met with in this country. The most severe of these is a cankering of the canes which is more marked in some varieties than others. The disease is never fatal during the first year, but its effects appear to be cumulative. In any case, it is more severe on cane arising from diseased seed, than on cane which has been infected secondarily in the field.

INJURIES RESEMBLING MOSAIC.

There are many types of injury commonly found on cane leaves which might be confused with the mosaic disease by one not familiar with it. Chlorosis, due for the most part to soil conditions, often closely simulates this trouble. Here, however, the affected areas are opaque white or yellow and are usually in the form of regular stripes which extend the entire length of the leaf blade, a condition which never occurs in the mosaic disease. The opaque stripes may be about one-eighth inch wide and numerous with regular stripes of the normal green tissue between them, or they may be quite wide. Often the entire leaf is quite white. Rarely the chlorosis takes the form of a very fine white mottling of the leaf, but always in local patches, and never does it involve the entire leaf, as is invariably the case with the mosaic disease. Many fungi cause spotting of the leaf blades but these can always be distinguished by the fact that the spots usually turn brown and the leaf tissue dies. This dying of the tissue never occurs in the mosaic disease. Many sucking insects cause a very fine mottling of the leaf when the punctures occur in very great numbers, but this type of injury can usually be determined by close inspection, since the minute pale halos about the punctures are invariably circular in form and never show a tendency to elongate in the direction of the long axis of the leaf as is the case with the mosaic. Ordinarily, the punctures are scattered and can lead to no confusion.



MAP OF MISSISSIPPI SHOWING LOCATION OF PROPERTIES INFECTED WITH MOSAIC DISEASE OF SUGAR CANE IN 1920.

TABLE I.

Table showing number of properties inspected for sugar cane mosaic disease by counties and number of properties found infected during period from July 1 to December 31, 1920.

COUNTY.	Properties inspected.	Properties infected.	Total Acreage inspected.
Amite	10	0	5
Attala	9	0	3 5/8
Choctaw	12	0	10 5/8
Calhoun	2	0	1 1/2
Copiah	5	0	3
Covington	12	1	5 1/2
Forrest	5	0	6 7/8
Franklin	4	0	5 1/4
George	3	2	2 1/4
Greene	2	1	2
Harrison	31	11	48 1/2
Jackson	20	2	23
Jeff Davis	10	0	4 1/2
Jones	7	0	3 5/8
Kemper	1	1	1/4
Lamar	12	4	8 1/2
Lawrence	4	0	5 1/4
Lauderdale	2	1	3 3/4
Leake	10	0	5 1/4
Lincoln	12	0	9 7/8
Madison	1	0	1/2
Marion	2	1	1 1/2
Montgomery	4	0	3 1/4
Newton	1	0	1/2
Pearl River	15	5	3 2/5
Pike	13	1	12 3/4
Quitman	1	0	1/4
Rankin	6	0	4 1/4
Scott	9	0	5
Simpson	5	0	2
Sharkey	1	0	1/2
Smith	10	0	2
Sunflower	1	0	3/4
Stone	14	1	30
Walthall	13	2	23 3/4
Wayne	1	1	1
Webster	1	0	3/4
Wilkinson	3	0	1 1/4
Yalobusha	1	0	1
Yazoo	2	0	2 1/2
Total number counties scouted, 40.	276	34	294 1/4

TABLE II.

Showing Sugar Cane Mosaic Infections located in Mississippi during period from July 1, to December 31, 1920.

No.	Property.	Town.	Acres.	Per cent infected.
1	James Brodie	Biloxi	3	10
2	O. A. Law	Biloxi	3	50
3	C. E. Law	Biloxi	1	5
4	Dr. Bolton	Biloxi	1 1/2	1
5	J. A. Flurry	Vancleave	6	10
6	J. E. Lockard	Vancleave	1/20	10
7	D. J. Gay	Biloxi	2 1/2	20
8	J. A. Sutter	Pass Christian	1 1/2	1
9	Henry Kron	Biloxi	1/4	Trace
10	P. J. Ohr	Biloxi	1/2	50
11	C. M. Chafee	Biloxi	1	5
12	Thomas Webb	Long Beach	1/8	90
13	L. K. Hill	Pass Christian	4	75
14	I. E. Bass	Lumberton	1/2	1
15	I. H. Bass	Lumberton	1 1/2	100
16	Webster Ladner	Lumberton	3	75
17	J. E. Bell	Lumberton	3/4	1
18	Eli Byrd	Lumberton	2 1/2	1
19	Wilmer Bryd	Lumberton	1	30
20	J. E. Byrd	Lumberton	1 1/2	1
21	O. W. Dunaway	Tylertown	1 1/2	1
22	N. R. O'Quinn	Tylertown	2	10
23	Joe Williams	Poplarville	3	1
24	Sol Moody	Poplarville	1/2	20
25	J. W. Watts	Columbia	1	20
26	W. M. Conerly	Tylertown	1/4	20
27	J. A. Allman	Lucedale	3/4	Trace
28	Mrs. J. H. Howell	Lucedale	1/2	Trace
29	Rufus McGill	Collins	1/2	Trace
30	James Byrd	Leakesville	3/4	Trace
31	L. K. Saul	Waynesboro	1	Trace
32	Nathan Roberts	Meridian	3/4	Trace
33	W. H. Beck	Scooba	1/4	5
34	J. B. Dorsett	Wiggins	10	Trace

HISTORY IN MISSISSIPPI.

Although the disease was found at only one point in Mississippi in 1919, at Biloxi, in Harrison County, reference to the map showing the location of the properties found infected this year will show that the disease is considerably more widely distributed in the state than one might be led to expect. There is no question but that most of these infections were present at that time, but were not found, as the survey made by the Government agent was necessarily quite general and hurried on account of the large area necessary to be covered.

Moreover, there is little doubt but that more thorough and extensive scouting, such as will be done by the State Plant Board next year, will reveal many more properties on which the disease occurs.

Reference to Table I will show that 276 properties in the state, located in 40 different counties, and comprising a total acreage of 294¼ acres, were visited and inspected either by the writer or by inspectors of the State Plant Board during the latter half of the present year. Of this number, 34 properties, located in 14 different counties, were found to be infected with the mosaic disease. The list of properties, and the per cent of the infection on each, is presented in Table II.

Below is given a brief account of the discovery of the disease in each of the infected counties.

Harrison County—On July 9, 1920, the writer, accompanied by Mr. R. P. Barnhart, Citrus Canker Inspector for the State Plant Board, rediscovered the disease on the property near Biloxi on which it had been found the previous year by a Government agent. The owner of this property had destroyed most of the stubble of the diseased cane but had planted a row of it immediately alongside a small patch of supposedly disease-free cane as an experiment to determine the rate at which the disease would spread. Practically all the canes from the diseased seed of the previous year, which was of the variety known as D74, and had been obtained from the Sugar Experiment Station of the Louisiana State University, at Audibon Park, were diseased, and approximately ten per cent of that adjacent to it was infected. However, the value of the experiment was rendered practically null, when it was discovered that the property from which the supposedly disease-free cane had been obtained was also infected with the mosaic. Another small patch of cane on the same property on which the experiment was being conducted, but completely isolated from the diseased D74 cane, was also found to be slightly infected. The seed for this patch was obtained from the same source as the supposedly disease-free stock mentioned above.

A number of different individuals in the county had obtained seed from this same source, and, though the per cent of infection on the property in question was only about one per cent this year, the percentage of infection on the cane grown from the seed obtained from it the previous year and distributed among a number of individuals ranged all the way from zero to practically one hundred per cent.

Jackson County—On July 23, 1920, the writer, accompanied by W. M. Mingee, employed by the U. S. Bureau of Entomology on Sweet Potato Weevil

Investigations, discovered the disease on a property near Vancleave. An infection of approximately ten per cent was found in a field of about six acres. The cane was a so-called white variety and the seed had been obtained from a neighbor who had brought it originally from Louisiana. On the next day the neighbor's property was investigated. It was found that he had lost most of his seed the previous winter and he had only a few stalks left, but they presented an infection of approximately fifty per cent of the mosaic disease.

Lamar County—The first infection in this county was found by the writer on August 25, 1920, on a property near Lumberton. It presented an infection of only about one per cent. However, on the property of the son of the individual referred to above, the cane was approximately one hundred per cent infected. The seed for this cane had been obtained from the father who stoutly maintained that it had been grown on his property for a considerable number of years. However, he later recalled that some ten years ago a few stalks of a rare variety had been obtained from the Experiment Station at Audibon Park, but that this variety had been discarded later since it did not prove desirable. It was undoubtedly from this source that the disease had been admitted to these properties.

On August 27, 1920, Mr. R. C. Price, an Inspector for the State Plant Board, located another slight infection on a nearby property, but it apparently had arisen from an entirely different source which could not be located exactly.

Pearl River County—On August 27, 1920, the writer located the first case of mosaic discovered in this county, only a short distance away from those recorded in Lamar County. Most of the infections located in this county and two of those found in Lamar apparently came from the same source, some cane of a white variety, whose origin could not be determined.

Walthall County—On August 30, 1920, the writer located the first infection found in Walthall County a few miles west of Tylertown on the Pike County line. This was a ten per cent infection, the source of which could not be determined, as the cane had been grown on the same property for a number of years. On September 13, 1920, the writer located another infection a few miles north of Tylertown. It was not severe, only about one per cent, and the owner claimed that the cane was home grown. However, there was a little white cane present, mixed with the other, for which he was unable to account.

Pike County—On August 30, the writer located the first and only infection found in Pike County so far. It was just over the line from Walthall County and the first infected property recorded in that county was less than a quarter of a mile away. The percentage of infection was about ten per cent in one field and about one per cent in another on the same property. Both were from home grown seed as far as could be determined.

Marion County—On September 10, Mr. R. C. Price, an inspector for the State Plant Board, reported finding a twenty per cent infection on a property a few miles from Columbia. As far as could be determined the cane had been grown on the same place for a number of years.

George County—On September 13, Mr. H. L. Dozier, Assistant Entomologist for the State Plant Board, reported finding a trace of the mosaic disease on two different properties near Lucedale. The cane was reported home grown in both cases. There is a probability that a more serious infection exists somewhere nearby, which has not yet been located.

Covington County—On September 14, Mr. E. K. Bynum, Inspector for the State Plant Board, reported finding the mosaic disease on a property near Collins. The cane was reported to have been grown on the farm for a number of years.

Greene County—On September 15, a trace of the mosaic disease was reported on a property near Leakesville by Mr. R. P. Colmer, an inspector for the State Plant Board.

Wayne County—On September 16, Mr. George L. Lott, an inspector for the State Plant Board, reported finding a trace of the disease on a property near Waynesboro. The cane had been grown on the farm for two or three years but could not be traced back farther than that.

Lauderdale County—On September 25, Mr. George E. Riley, an inspector for the State Plant Board, reported finding sugar cane mosaic disease on a property near Meridian. The degree of infection was not reported. The cane was reported home grown for six years.

Kemper County—On September 28, Mr. George E. Riley reported another infection of sugar cane mosaic near Scooba. This was also home grown cane, so far as could be ascertained, and was reported as a medium infection.

Stone County—On September 28, Mr. D. C. Neal, Plant Pathologist for the Mississippi Agricultural Experiment Station, reported finding a trace of the mosaic disease in a ten acre field near Wiggins.

LOSSES DUE TO THE MOSAIC DISEASE.

No extensive data has been accumulated as yet, owing to the short period of time that has elapsed since the disease was first recognized in this country, to determine whether the loss caused by the sugar cane mosaic is as great here as in Porto Rico. However, a few figures reported from Louisiana indicate that it may cause a decrease in yield almost as large as that experienced on that island if it is allowed to become widespread here. There the loss varies from five to forty per cent, depending upon the variety of cane, with most of the instances varying toward the higher figure. The owner of one property in Mississippi, which was found very severely infected with the disease, reported that he had realized for some time that something was wrong with his cane as it did not appear to thrive as it should and the yield was low. He had made efforts to find out what the trouble was, and failing in that, had about decided to destroy his stubble and start over with new seed. This instance sheds some light on what the disease can do when it once becomes established in a field.

Experiments have shown that cane free of the disease grows off much faster than diseased cane and undoubtedly will make a better yield. Cane affected by the disease often makes a good growth in favorable situations, but never makes the growth that healthy cane would make under the same conditions.

QUARANTINE AND CONTROL MEASURES.

The State Plant Board of Mississippi, recognizing the serious nature of the disease, and realizing that now, before it gains too firm a foothold, is the time to take steps toward its eradication in the State, has passed quarantine regulations prohibiting the importation of sugar cane, for any purpose whatsoever, into the State from any other state without a special permit, to be granted by the State Plant Board, when it is assured by the proper authorities that the cane in question is free from the disease and is from a region in which the disease is not known to occur. It also has passed regulations forbidding the shipment of sugar cane from the infected counties in this state to any other counties where the disease is at present unknown.

Where the infections of the mosaic disease is only 20 per cent or below, a method of control known as "roguing" is advised. This consists in going through the field and pulling up by the roots all infected stalks. These stalks may then be thrown down between the rows, since, as soon as they have begun to wilt, there is no further danger of infection from them. The incubation period of the disease is about seventeen days, that is, it is seventeen days after the cane has been infected, before it becomes apparent. For this reason, the roguing process should be repeated at intervals of not more than a month, in order to get rid of all stalks which may have been infected but were in the incubation period, at the former time. When repeated examination at the stated intervals reveals no more infected stalks, the owner may feel assured that he has gotten rid of the disease.

In cases where the percentage of infection is greater than 20 per cent, the loss due to the destruction of the diseased stalks would be too great to permit of this method. In such a case, the owner should grind his cane and make his syrup as usual but should save no seed from the infected field. He should also destroy all refuse and plow up and destroy the stubble. The ground should then be devoted during the next year to some crop other than grain, as, for instance, potatoes, peas, beans, etc. He should then take care in getting seed for the next year from a property that is free from the disease. If these precautions are followed, and the new seed is planted in ground not devoted to sugar cane the previous year, the new crop should be free from mosaic.

EXAMINATION OF SPECIMENS.

The State Plant Board is always ready to examine specimens for any grower in the state if he is in doubt in regard to any trouble he may be having. Specimens of the mosaic disease of the sugar cane are usually quite unsatisfactory when sent in, due to the fact that the plants soon discolor, which makes identification of the disease difficult. However, if the top of a diseased stalk is cut off, the cut end wrapped in a moist cloth, and mailed immediately in a box or similar container, it may reach us before this discoloration occurs. We are glad to get specimens as it assists us in our survey of the state. In any case, if you are in doubt as to whether or not your sugar cane has the mosaic disease, notify the State Plant Board, and if possible, we will see that one of our inspectors visits you. Address all communications concerning the mosaic disease to the Plant Pathologist, State Plant Board, Agricultural College, Mississippi.

AVAILABLE PUBLICATIONS.

Available publications on the mosaic disease of sugar cane are:

(1) Brandes, E. W., 1919—The Mosaic Disease of Sugar Cane and Other Grasses—U. S. Dept. Agr. Bul. 829.

(2) Brandes, E. W., 1920—Artificial and Insect Transmission of Sugar Cane Mosaic—Jour. Agr. Research, Vol. 19, pages 131-138.

(3) Edgerton, C. W., 1920—A Method of Selecting L511 Cane Free of the Mosaic Disease for Planting Purposes—Louisiana Bul. No. 176.

EXPERIMENT STATION,
Division of Horticulture.

BULLETIN No. 192
DECEMBER, 1920

Report of Cotton Experiments at The Holly Springs Branch Experiment Station

SEASONS 1919 AND 1920

BY C. T. AMES

THE MISSISSIPPI
AGRICULTURAL AND MECHANICAL COLLEGE

J. R. RICKS
DIRECTOR

COTTON EXPERIMENTS

At the Holly Springs Branch Experiment Station Season 1919 and 1920

BY C. T. AMES.

The Holly Springs Branch Experiment Station has been carrying on certain cotton experiments for a number of years to obtain information that would be of value to cotton growers in North Mississippi and especially to those living in the brown loam soil belt of the State. Until 1919 the results were published each year in a general cotton bulletin issued by the College station and branch stations jointly. With the increase in experimental data collected and increased cost of printing, it was thought best to publish the reports separately. By doing this economy is practiced in that a grower in any particular section of the State can be furnished only the data in which he is expecially interested.

This bulletin contains Holly Springs weather records for 1919 and 1920, results from variety studies on hill and valley land, fertilizer tests, and spacing tests for those years. Suggestions for cotton culture in the brown loam soil belt are also made.

THE WEATHER.

The season of 1919 was the most unsatisfactory within the memory of the writer. The weather was very wet during the spring and summer, very dry during mid-summer, and wet during the fall at picking time. No boll weevils appeared at any time during the season. All of the varieties were more or less injured by blight.

In the season of 1920, the average mean temperature was lower than that of 1919, and the precipitation above the general average. Precipitation was 4.71 inches above normal in April; 2.20 in May; 2.70 in June; and .60 inches below normal in July; 1.21 below in August, and .88 below in September. Where good stands were secured and good cultivation given during May and June, good yields were secured. The season was near normal during July, August, and September. Boll weevils were plentiful in the fall but came too late to do much damage.

TABLE 1—Temperature and Rainfall, Holly Springs Station, 1919 and 1920.

Temp. and Precipt'n	Y'r	Jan.	Feb.	Mch.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean temperature	1919		46.3	53.5	61.6	67.0	77.0	81.1	81.6	77.2	70.5		
	1920	40.4	43.6	51.4	59.6	71.0	76.2	79.5	77.3	76.2	65.8	48.3	
Precipitation in inches	1919		3.33	8.50	4.26	7.10	3.88	1.08	1.65	1.51	9.06		
	1920	7.58	2.03	3.03	9.85	6.48	7.11	3.58	2.99	4.37	1.29	2.44	
Normal precipitation	1919		4.50	6.64	5.14	4.28	4.32	4.18	4.20	3.52	2.26		
	1920		4.50	6.64	5.14	4.28	4.32	4.18	4.20	3.52	2.26		

VARIETY TEST ON VALLEY LAND, 1919.

The cotton in the valley land variety test was planted April 25, on brown loam soil. Skips in the stand were replanted by hand May 17. Excessive rains and coco grass injured the stand to some extent. The plots were 1-16 acre each; one row 5 feet wide and 230 feet long was repeated three times. The land was fertilized with a mixture of 100 pounds of cottonseed meal and 200 pounds of acid phosphate applied at the rate of 300 pounds per acre.

TABLE 2—VARIETY STUDIES ON VALLEY LAND—HOLLY SPRINGS STATION, 1919.

VARIETY	Plot yield first picking	Plot yield second picking	Plot yield third picking	Total yield seed cotton per acre	Lint per cent	Pounds of lint per acre	Length of lint	Value of lint	Pounds of seed per acre	Value of seed at $75 a ton	Total money value per acre	Rank in money value
Simpkins	26.5	51	77.5	1240	32.8	406.72	15/16	168.79	833.28	31.24	200.03	18
Trice 270-41	48	49	97	1552	29.4	456.28	1- 1/16	196.20	1075.72	40.35	236.55	9
Trice (Ark. Station)	33	45.5	78.5	1256	29.4	370.52	7/8	151.91	885.48	33.23	185.14	22
Vandiver's Heavy Fruiter	14	68	82	1312	32.0	419.84	15/16	174.23	892.16	33.45	207.68	15
Cook-588	14	63.5	77.5	1240	34.9	432.76	16/16	179.60	807.24	30.26	209.86	14
Half and Half*	8	47	55	880	31.4	276.32	15/16	114.67	603.68	22.65	137.32	24
Wannamaker-Cleveland	8.5	74	82.5	1480	34.7	513.56	7/8	210.56	966.44	36.26	246.82	7
Cleveland Big Boll	14	80	94	1504	32.8	493.31	15/16	204.72	1010.69	37.91	242.63	8
Mexican Big Boll	21.5	60	81.5	1304	31.1	405.54	1	170.33	898.46	33.71	204.04	16
Sunbeam	6.5	48	54.5	872	31.0	270.32	1	113.53	601.68	22.57	136.10	25
Triumph	23.5	69.5	92.5	1480	37.1	549.08	1-1 1/16	236.10	930.92	34.91	271.01	3
Miller	8	62	70	1120	31.0	347.20	1-1/16	156.24	772.80	28.99	185.23	21
Lone Star-15	17.5	66	83.5	1336	33.5	447.56	1	187.98	888.44	33.30	221.28	13
Lone Star-132-48	20	58	78	1248	29.5	368.16	1 1/16	165.67	879.84	33.00	198.67	19
Magnolia	25.5	44	69.5	1112	26.3	292.45	1 1/8	146.22	819.55	30.75	176.97	23
Polk	23.5	59	82.5	1320	27.8	366.96	1 3/16	220.18	953.04	35.74	255.92	6
Express-432	20.5	56	76.5	1224	31.9	390.45	1/18	195.22	833.55	31.27	226.49	12
Express-122-433	27	63	90	1440	27.1	390.24	1 3/16	234.14	1049.76	39.37	273.51	2
Express-350	26.5	50.5	77	1232	26.5	326.48	1 1/8	163.24	905.52	33.97	197.21	20
Foster-11	19.5	63.5	83	1328	28.7	381.14	1 3/16	228.68	946.86	35.51	264.19	4
Columbia	15	60.5	75.5	1208	27.8	335.82	1 3/16	201.49	872.18	32.70	234.19	10
Webber-49	19	65	84	1344	28.1	377.66	1 3/16	226.60	966.34	36.22	262.82	5
Sunflower	14.5	67	81.2	1304	26.0	339.04	1 5/16	281.40	964.96	36.19	317.59	1
Allen	10	46	56	896	25.6	229.37	1 1/4	178.91	666.63	25.01	203.92	17
Meade	7	48	55	880	25.9	227.92	1 3/8	205.13	652.08	24.45	229.58	11

*The seed planted were probably not Half and Half seed, although bought for that.

TABLE 3—VARIETY COTTON STUDIES ON BROWN LOAM VALLEY LAND, 1920.

Date of Planting—April 23, 1920.
Plots—One row each, repeated four times. Rows—3½x325 feet.

	VARIETY	Dates of Picking.			Plot Yield Total.	Total Yield Seed Cotton Per Acre.	Lint per cent.	Pounds of Lint Per Acre.	Length of Lint.	Value of Lint Per Pound.	Value of Lint.	Pounds of Seed Per Acre.	Value of Seed at $25 per Ton.	Total Money Value per Acre.	Rank in Money Value.
		Sept. 28	Oct. 21	Dec. 1											
1	Simpkins Ideal	98	97	9	204.0	1953.1	34.2	668.0	1	16	106.88	1285.1	15.06	121.94	10
2	Huffman	93	92	12.	197.0	1886.1	32.17	606.8	1-1/16	17	103.16	1279.3	15.99	119.15	12
3	Cleveland-Wannamaker	71.5	100	13	184.5	1766.4	35.0	632.4	1-1/16	17	107.51	1134.0	14.18	121.69	11
4	Coker's Ped. Cleveland	77	110	11.5	198.5	1900.4	35.6	676.5	1-1/16	17	115.01	1223.9	13.29	128.30	8
5	Cleveland 37W-54	94	104	11	209.0	2000.9	34.5	690.3	1-1/16	17	117.35	1310.6	16.38	133.73	4
6	Cleveland Big Boll	60.5	106	15.	181.5	1737.7	33.3	578.7	1-1/16	17	98.38	1159.0	14.48	112.86	13
7	Smith's Cleveland	110.5	95	8.5	214.0	2048.8	32.7	670.0	1-1/16	17	113.90	1378.8	17.24	131.14	6
8	Express 122-433	114.5	66	7	187.5	1795.1	28.05	503.5	1-3/16	23	115.81	1291.6	16.14	131.94	5
9	Cook's 1010	95	90	10.5	195.5	1871.7	678.8	36.8	1-1/16	17	115.40	1192.9	14.91	130.31	7
10	Mexican Big Boll	88	87	14.5	189.5	1814.3	31.3	567.9	1-1/16	17	96.54	1246.4	15.58	112.12	14
11	Miller	67.5	101	27	195.5	1871.7	31.5	589.6	1-1/8	19	112.02	1292.1	16.14	128.17	9
12	Triumph	43	70	19	132.0	1263.8	35.4	447.4	1-1/8	19	85.01	816.4	10.20	95.21	17
13	Acala No. 5	78	71	14.5	163.5	1565.4	35.6	557.3	1-3/16	23	128.18	1008.1	12.60	140.68	3
14	Cook's 588	87	73	11	171.0	1637.2	37.2	609.0	1	16	97.44	1028.2	12.85	110.29	15
15	Vandiver's Heavy Fruiter	57	103	16	176.0	1685.0	32.3	544.3	1-1/16	17	92.53	1140.7	14.25	106.78	16
16	Webber 49	59	76	10	145.0	1388.2	28.5	395.6	1-3/8	37½	148.35	992.6	12.41	160.76	2
17	Hartsville No. 12	32	115	11.5	158.5	1517.5	28.7	435.5	1-3/8	37½	163.31	1082.0	13.52	176.83	1

Staple Quotations; November 29, 1920, New Orleans Market. Strict Middling, Good character.
Stapling by C. W. Willis, Pontotoc, Mississippi.

TABLE 4—HILL LAND VARIETY TEST, 1919.

Variety.	Pounds of seed cotton per plot.	Pounds of seed cotton per acre.	Total money value.
Trice 270-41	50.0	1000	$ 152.89
Wannamaker-Cleveland	45.5	910	151.73
Cleveland Big Boll	44.0	880	141.96
Express	49.0	980	196.62
Miller	50.0	1000	165.37

Soil—Brown loam table land.

Fertilizer—Mixture of 100 pounds of cottonseed meal and 300 pounds of acid phosphate.

Plots—Five varieties; 1-20 acre to each variety; one row each, repeated six times; planted April 25, 1919; replanted May 19, 1919.

COTTON VARIETIES.

The variety grown in any section is of far more importance than is generally understood. In the past fifteen years in our variety test, there has been more than an average of thirty-five dollars difference per acre each year, in money value, in varieties. In many instances seed are sold under a false name, local names frequently being used. Out of nineteen varieties used in the test this year, two were not true to name and their results discarded. When a good variety is secured by any grower, every effort should be made to keep the seed pure and of best quality.

We recommend the following varieties for this section:

For hill land—

Cleveland 37W-54
Wannamaker-Cleveland
Cleveland Big Boll
Miller
Triumph
Cook

For valley land—

Wannamaker-Cleveland
Trice-270-41
Express-122-433
Webber-49
Sunflower

In the 1920 test, Wannamaker-Cleveland, Cleveland Big Boll, Triumph, and Miller were below their usual standing; we recommend them on their past records. Hartsville No. 12 and Acala No. 5 have been in the test only one year. Trice 270-41 is somewhat susceptible to wilt, but on fertile soils where there is no wilt, it produces heavy yields and a fair staple (one and one-eighth).

Before the War, when there was only a few cents difference per pound between short and long staple cotton, the short staple varieties at this Station gave the greater money value. During the War and at present, when a much wider difference in price per pound exists, the long staple varieties give the higher money value. No variety of cotton that pulls less than one inch staple should be grown; a sixteenth inch longer would be better. In many sections where only varieties with very short staples are grown, buyers pay two to three cents less per pound for all the cotton grown. Some of the best buyers do not establish offices in such sections.

TABLE 5—FERTILIZER TEST WITH COTTON, 1920.

Soil—Brown Loam Valley land, used for pasture fourteen (14) years prior to this work and on which we feel safe in saying no commercial fertilizer was ever used. The grazing crops were principally bermuda grass and lespedeza.

Plots—Four rows each, 3½ feet wide and 72 feet long, making 1-43.21 acre each. Record was only taken from the two inside rows. Most of the planting was in duplicate, as will be seen in table below.

Planted—May 10, 1920, in Trice 270-41 Cotton, germination taking place in five days.

FERTILIZER USED.	Yield of seed cotton per acre Series 1	Increase over check per acre	Yield of seed cotton per acre Series 2	Increase over check per acre	Average increase over checks
200 lbs. Acid Phosphate	2290.4	453.8	2506.5	345.7	399.8
Check	1836.6		2160.8		
400 lbs. Tenn. Phos Rock	1913.5	76.9	2376.8	216.0	146.5
400 lbs. Fla. Soft Rock	2204.0	129.7	2333.6	302.5	216.1
Check	2074.3		2031.1		
200 lbs. Duplex Phosphate	2290.4	216.1	2117.5	86.4	151.2
100 lbs. Kainit	2376.8	86.4			86.4
Check	2290.4		2074.3		
250 lbs. Cotton Seed Meal	2592.9	302.5	2549.7	475.4	389.0
100 lbs. Nitrate Soda	2536.1	764.3	2506.5	432.2	598.2
Check	1771.8		2074.3		
200 lbs. Tankage	2117.5	345.7			345.7
50 lbs. Cyanamid	2074.3	216.1	2722.5	388.9	302.0
Check	1858.2		2333.6		
75 lbs. Sulphate Ammonia	2009.5	151.3	2592.9	259.3	205.3
50 lbs. Nitrate Ammonia	2420.0	475.3	2355.2	280.9	378.1
Check	1944.7		2074.3		
200 lbs. Dried Blood 25 lbs. Nitrate Ammonia	2333.6	388.9			388.9
37 1-2 lbs. Sulphate Ammonia	2592.9	388.9	2247.2	172.9	280.9
Check	2204.0		2074.3		
50 lbs Nitrate Soda			2031.1		
125 lbs. Cotton Seed Meal	2722.5	518.5	2247.2	216.1	367.3
50 lbs. Nitrate Soda					
100 lbs. Tankage	2636.1	216.1			
Check	2420.0		2031.1		
Soak Seed in Ni. Soda Solution 50 lbs. After first working. 50 lbs. On July 1st	2592.9	172.9	2160.8	129.7	151.3
250 lbs. Cotton Seed Meal					
200 lbs. Acid Phosphate	2547.7	636.2	2592.9	821.1	728.6
Check	1901.5		1771.8		
100 lbs. Nitrate Soda					
200 lbs. Acid Phosphate	2333.6	432.1	2420.0	648.2	540.1
200 lbs. Tankage					
200 lbs. Acid Phosphate	2722.5	713.0	2247.2	519.6	616.3
Check	2009.5		1728.6		
50 lbs. Nitrate Soda					
37½ lbs. Sulphate Ammonia	2333.6	324.1			324.1
75 lbs. Cyanamid					
200 lbs. Acid Phosphate	2160.8	151.3	2506.5	605.0	383.1
Check	2009.5		1901.5		
75 lbs. Sulphate Ammonia					
200 lbs. Acid Phosphate	2528.1	518.6	2290.4	388.9	453.7
200 lbs. Dried Blood					
200 lbs. Acid Phosphate	2679.3	648.2			648.2
Check	2031.1		1728.6		
100 lbs. Nitrate Soda					
400 lbs. Tenn. Phos. Rock	2592.9	561.8	1858.2	129.6	345.7
100 lbs. Nitrate Soda					
400 lbs. Fla. Soft Rock	2506.5	216.1	1944.7	216.1	216.1
Check	2290.4		1728.6		
100 lbs. Nitrate Soda					
200 lbs. Duplex Phosphate	2765.8	475.4	1901.5	129.7	302.5
Check	2074.3		1771.8		
100 lbs. Nitrate Soda					
200 lbs. Acid Phosphate					
50 lbs. Kainit	2852.2	777.9	2160.8	432.2	605.0
Check			1728.6		

Remarks—The growing season was very wet until the middle of September; after this, there was but little rain. Bermuda grass and excessively wet soils affected results. The first boll weevil appeared about August 19, which was too late to do much damage.

Conclusions—The indications are that brown loam soils, even after long pasture periods, respond to the use of both nitrogen and phosphorous under favorable weather conditions. Under ordinary weather conditions, acid phosphate at the rate of 200 pounds per acre the first year after pasture, gives good results.

COTTON CULTURE.

Fertilizers—In all North Mississippi, except the Prairie and Mississippi Delta, the use of from 200 to 400 pounds of a high grade fertilizer per acre will be found profitable. Fertilizers that will analyze from 10 to 12 per cent of phosphorous and 3 to 4 per cent of nitrogen should be used. Where a large quantity of a leguminous crop is turned under, 200 pounds of acid phosphate may be sufficient. A mixture of 200 pounds of cottonseed meal and 200 pounds of acid phosphate, or a mixture of 100 pounds of nitrate of soda and 200 pounds of acid phosphate per acre, or the equivalent in other forms of readily available nitrogen, is the most economical quantity of fertilizer we have found for soils of ordinary fertility.

Apply all the mixed fertilizers under the seed before planting. When nitrate of soda is to be used, it may be applied with the acid phosphate at planting time or after the first working of the crop. If the season is wet or the field is infested with coco grass, the latter method is preferable. If cotton seed are soaked for a few minutes in a saturated solution of nitrate of soda and water, and the seed dried before planting, good results may be obtained.

Preparation and Cultivation—Contrary to the teachings of agriculture, we have found fall plowing on rolling hill land not advisable in this section unless a cover crop is planted or a heavy crop of vegetable matter is turned under and the soil left rough. On slightly rolling or valley land this will not apply, though a winter cover crop will not be less profitable on such soils. The damage from washing is, of course, much less when the land is properly surface drained with a broad shallow terrace, which has a little fall. Slightly elevated rows are desirable under ordinary conditions. These may be obtained by flat breaking the land, disking and harrowing, laying off three and one-half foot rows, and applying fertilizer at the same time with a two-row corn planter and a fertilizer distributer. The rows may be covered sufficiently by running a middle breaker between them, and the desired elevation may be had by the use of a section harrow. If possible, this should be done about two weeks before planting time so that the rains will settle the soil and a firm seed bed will be secured. However, a firm seed bed is of less importance in early spring as rains are frequent.

Cotton planting time for this section is around April 20, or a little later. The boll weevil being a factor, the early planting of early maturing varieties on well fertilized soil, narrow rows, close spacing (ten inches), and frequent shallow cultivations are advised. Frequent shallow cultivations should continue until early September, when winter cover crops may be planted. Vetch, crimson clover, rye, and wheat are good winter cover crops.

TABLE 6—SPACING TEST, 1919

Row	Variety of Cotton Used.	Width of Row	Distance in Drill	Picked Sept. 16	Picked Nov. 20	Total per Plot	Total per Acre	Average per Acre
1	BLANK Trice 270–41							
2	Trice 270–41							
3	Trice 270–41	3 ft.	9 in.	23	13.5	36.5	1245	
4	Wannamaker-Cleveland							
5	Wannamaker-Cleveland	3 ft.	9 in.	16	27	43		
6	Cleveland Big Boll							
7	Cleveland Big Boll	3 ft.	9 in.	21	25	46	1608	1452 lbs.
8	BLANK Trice 270–41							
9	Trice 270–41							
10	Trice 270–41	3.5 ft.	12 in.	18	40	58	1740	
11	Wannamaker-Cleveland							
12	Wannamaker-Cleveland	3.5 ft.	12 in.	14	32	46	1380	
13	Cleveland Big Boll							
14	Cleveland Big Boll	3.5 ft.	12 in.	22	29	51	1530	1550 lbs.
15	BLANK Trice 270–41							
16	Trice 270–41							
17	Trice 270–41	4 ft.	9 in.	26	22.5	48.5	1272	
18	Wannamaker-Cleveland							
19	Wannamaker-Cleveland	4 ft.	9 in.	15.5	35	50.5	1325	
20	Cleveland Big Boll							
21	Cleveland Big Boll	4 ft.	9 in.	21	30	51	1338	1312 lbs.
22	Trice 270–41							
23	Trice 270–41	4 ft.	16 in.	22	18	40	1050	
24	Wannamaker-Cleveland							
25	Wannamaker-Cleveland	4 ft.	16 in.	11.5	37	48.5	1272	
26	Cleveland Big Boll							
27	Cleveland Big Boll	4 ft.	16 in.	17.5	26.5	44	1155	1159 lbs.
28	BLANK Trice 270–41							
29	Trice 270–41							
30	Trice 270–41	3 ft.	16 in.	17.5	15.5	33	1152	
31	Wannamaker-Cleveland							
32	Wannamaker-Cleveland	3 ft.	16 in.	8	21.5	29.5	1032	
33	Cleveland Big Boll							
34	Cleveland Big Boll	3 ft.	16 in.	10	20	30	1050	1078 lbs.

Soil—Table land of medium and somewhat uneven fertility.

Plots—Six rows each with three varieties of cotton each plot, two rows each.

Rows—210 feet long.

Fertilizer—A mixture of 200 lbs. cotton seed meal and 200 lbs. acid phosphate per acre.

Date of Planting—April 25, 1919. Replanted: May 19, 1919.

Remarks—The last plot in the table composed of rows 28 to 34 inclusive is considerably off in fertility, but no allowance has been made in the above table.

TABLE 7—COTTON SPACING, 1920.

Variety.	Space in drill.	Yield in lbs. per plot.	Yield in lbs. per acre.
Cleveland-Wannamaker	6 in.	458	1207.64
Cleveland-Wannamaker	12 in.	473	1249.67
Cleveland-Wannamaker	18 in.	486	1284.01
Cleveland-Wannamaker	24 in.	431	1138.70

Soil—Slightly rolling upland.

Plots—Four rows, each 295 feet long, repeated four times.

Planted—May 11, 1920.

Fertilizer—A half and half mixture of cottonseed meal and acid phosphate was applied at the time of planting at the rate of about 250 pounds per acre.

Remarks—The boll weevil appeared about September 12, but was too late to do any damage.

Conclusions—In the past, results have been much more marked in favor of three and one-half foot rows and twelve inches in the drill. The above results indicate eighteen inches in the drill. On thin land where one horse tools are used, a three-foot row with plants a hoe's width apart will usually make more cotton than the wider rows and broader spacing.

COTTON DISEASES.

Cotton Wilt—This disease seems to be confined to sandy or sandy loam soils and is more serious during wet seasons. No fungicide or fertilizer has been found that will prevent this disease as it is a fungus growth that develops within the plant and remains in the soil for years. The best known method for controlling this disease is to plant wilt resistant varieties. Seed from plants not affected by wilt when grown on infected soils, if selected each year, may develop better varieties for growing on infected soils.

Cotton Rust—Rust in cotton may be checked very materially by the use of one hundred pounds of kainit per acre.

TWO-YEAR ROTATION.

A satisfactory two-year rotation can be maintained by planting fifteen pounds of vetch seed per acre in the middles before the last working of cotton. Allow the vetch to seed the following spring, turn it under, and plant the land to corn. The next year plant to cotton. There will be enough vetch seed in the soil to insure a good stand in the cotton. Allow the vetch to mature seed, save vetch for hay, turn land and plant to cotton as before. This will give three crops in two years and greatly increase soil fertility.

BULLETIN NO. 193 DECEMBER, 1920

REPORT FROM

HOLLY SPRINGS BRANCH EXPERIMENT STATION

FOR 1915 TO 1920 INCLUSIVE

BY C. T. AMES

Photograph of this cut of hairy vetch taken May 1, 1917. *This vetch was sown in cotton middles at the last plowing in the summer before.* (*See two-year rotation, page* 19.)

MISSISSIPPI AGRICULTURAL EXPERIMENT STATION
Agricultural College, Mississippi

J. R. Ricks, Director

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Report of the Work at the Holly Springs Branch Experiment Station

By C. T. AMES

INTRODUCTION

The Holly Springs Branch Experiment Station has been carrying on certain cotton, corn and fertilizer experiments for a number of years to obtain information that would be of value to farmers of North Mississippi, and especially to those living in the brown loam belt of the State. These results have been published from time to time, in bulletins issued by this station, and in cotton and corn bulletins issued by the College Station and branch stations jointly. With the increase in experimental data collected and increased cost of printing it was thought best to publish the reports separately. This arrangement makes it possible to supply growers with only the data in which they are especially interested. Two bulletins, one on corn, No. 189, and one on cotton, No. 192, have just been published by this Station; these deal more fully with those subjects than this report. This bulletin contains a discussion of and certain data on the following: Variety tests of cotton on hill and valley land; cotton spacing; fertilizer tests with cotton, corn, and legumes; corn and sweet potato variety tests; the growing of crimson clover, burr clover and velvet beans; and the relation of dairy to farm.

EROSION.

The desire to find a practical and satisfactory method of controlling soil erosion in the northern hill section of the State, no doubt had much to do with the location of this Station. As Bulletin No. 165 discusses the subject of soil erosion, and the most practical methods we have found of controlling same, only brief mention of the subject will be made here. It has been demonstrated time and again that land can be terraced for $1.00 per acre, unless the land is badly broken. This is for labor alone, under normal conditions. Any man can terrace any sized farm easily with the labor it takes to cultivate the farm, between the time the crop is harvested in the fall and the beginning of a crop the next spring.

A vast majority of the farmers, in this section, are, each year paying the penalty of soil terracing neglect by shorter crops and poorer land. It is almost useless to attempt to build up any soil that washes with every rain Winter cover crops will assist very materially; planting the broken lands in grasses for pasture will also help; but neither of these methods can be expected to give satisfactory results without a system of broad shallow terraces to control the surface water that falls during heavy rains. Both State and Federal Government forces can be secured to assist in terracing work.

COTTON.

Varieties—The variety grown in any section is of far more importance than is generally understood. The past fifteen years in our variety tests there has been an average of thirty-five dollars difference per acre each year, between different varieties. In many instances seed are sold under a false name, local names frequently being used. Out of nineteen varieties used in the test this year, two were not true to name and their results discarded. When a good variety is secured by any grower, every effort should be made to keep the seed pure and of the best quality. We recommend the following varieties for this section.

For Hill Land—Cleveland 37W-54, Wannamaker-Cleveland, Miller, Cleveland Big Boll, Triumph and Cook. For Valley Land—Wannamaker Cleveland, Trice 270-41, Express-122-433, Webber 49 and Sunflower.

Wannamaker-Cleveland, Cleveland Big Boll, Triumph and Miller are all below their usual standing in 1920. We recommend them on their past records. Hartsville No. 12 and Acala No. 5 have been in the test only one year. Trice 270-41 is somewhat susceptible to wilt, but on fertile soils where there is no wilt, it produces heavy yields and a staple 1 1-16 inches in length.

Before the war, when there was only a few cents difference per pound between short and long staple cotton, the short staple varieties at this station gave the greater money values. During the war and at present, when a much wider difference in price per pound exists, the long staple varieties give the highest money values. No variety of cotton that pulls less than one inch staple should be grown, 1-16 inch longer would be better. In many sections where very short varieties are grown, the buyers pay from two to three cents less for all the cotton grown. Some of the best buyers do not establish offices in such sections.

TABLE No. 1 SEVEN YEAR COTTON VARIETY TEST ON VALLEY LAND.

Variety Cotton	1914 Pounds of Seed Cotton	1914 Money Value of Seed Cotton	1915 Pounds of Seed Cotton	1915 Money Value Seed Cotton	1916 Pounds of Seed Cotton	1916 Money Value Seed Cotton	1917 Pounds of Seed Cotton	1917 Money Value Seed Cotton	1918 Pounds of Seed Cotton	1918 Money Value Seed Cotton	1919 Pounds Seed Cotton	1919 Money Value of Seed Cotton	1920 Pounds Seed Cotton	1920 Money Value of Seed Cotton	Length of Staple
Simpkins	1863	53.48	1843	83.46	1594	146.29			1187.3	149.65	1240	200.03	1953	121.94	1
Cook	2464	75.17	1966	105.17	1508	135.48	874	112.44							7/8
Trice	1948.8	58.93	2116	98.34	1872	158.90	1044.8	121.09	1111	138.37					1 1/16
Triumph	2052	64.84	2109	118.06	1625	166.42	963.7	142.40	1208.3	173.15	1480	271.01	1263.8	95.4	1 1/16
Durango	2111	96.79	1858	108.19											1 3/16
Haaga's Wonderful			1980	106.41											1/2
Dodd's Prolific	2199	60.70	2066	97.51			1058.2	139.64	1325.1	165.32					1 1/16
Wannamaker Cleveland	2376	73.47	2246	120.38	1521	134.57	994.6	132.55	1609.	220.13	1480	246.82	1766.4	121.59	1
Miller	2355	83.82	2218	121.51	1632	164.28	971.5	135.58	1589.	209.49	1120	185.23	1871.7	128.17	1 1/16
Cleveland Big Boll	2452	74.56	2325	121.17	1261	107.76	905.7	117.65	1435.	197.52	1504	242.63	1737.7	112.86	1 1/16
Cleveland-027-11-24			2275	104.84	1723	152.58									1
Lone Star 132			2260	111.97			1067.8	144.60	1305.7	164.00					1 3/16
Foster			1930	113.35			1044.7	155.26							1 3/16
Express General	2254	92.16	2189	114.08	1508	122.91									1 3/16
Foster No. 11			1987	115.43											1 1/4
Lone Star-15			2153	116.13	1612	185.31	1117.9	170.06	1284.6	181.87	1336	221.28			1 1/16
Lone Star-11			2131	119.03			1157.8	170.65	1308.9	181.96	1328	264.19			1 1/16
Express-15			2239	119.83											1 1/8
Polk			2232	120.73	1385	142.78	848.1	122.18			1320	255.92			1 3/16
Sunflower	2161	74.40	1865	124.92	1203	133.74					1304	317.59			1 5/16
Express-122			2260	125.20	1586	149.50	1187.3	156.60							1 3/16
Unknown	1907	85.59	2254	137.35	1573	170.76	1221.2	166.66							1 3/16
Lone Star					1502	161.16									1 1/16
Holdon					995	100.33									1 1/16
Columbia	2090	93.33			1209	129.49	632.2	96.08	1430.6	196.80	1208	234.19			1 5/16
Express-350					1827	182.35	1395.5	189.52			1232	197.21			1 3/16
Express-341					1573	163.32									1 3/16
Panther Burn					1105	115.37									1 1/4

TABLE No. 1 Continued.

Variety Cotton	1914 Pounds of Seed Cotton	1914 Money Value of Seed Cotton	1915 Pounds of Seed Cotton	1915 Money Value Seed Cotton	1916 Pounds of Seed Cotton	1916 Money Value Seed Cotton	1917 Pounds of Seed Cotton	1917 Money Value Seed Cotton	1918 Pounds of Seed Cotton	1918 Money Value Seed Cotton	1919 Pounds Seed Cotton	1919 Money Value of Seed Cotton	1920 Pounds Seed Cotton	1920 Money Value of Seed Cotton	Length of Staple
Columbia Sherard's							859	120.06							1 3/16
Express-32							1267.5	170.32							1 3/16
Trice 270-41							1557.4	211.51			1552	236.55			1 1/8
Foster 120-437							1121.8	164.64							1 1/4
Webber-49							801		1330	182.71	1344	262.81	992.6	160.16	1 1/4
Rowden							928.2	125.42	1346	191.83					1 1/8
Sproull's Big Boll							804.9	106.00							1 1/16
Ped'g'd-Wan-m'r-Cleveland									1609	221.98					7/8
Cook-1010									1589	226.42			1871.7	130.30	7/8
Half and Half	2304	78.40							1613	213.82					3/4
Mexican Big Boll									1503	201.79	1304	204.04	1814.3	112.20	1 1/16
Sunbeam									1463	193.17	872	136.10			7/8
Lone Star 132-467									1235	145.54					1 3/16
Express 122-4104									1362	177.98					1 3/16
Express 122-475									1321	166.74					1 1/16
Express 122-433									1235	161.07	1440	273.51			1 3/16
Express 432									1560	216.01	1224	226.49			1 1/8
Foster 120-449									1138	150.66					1 1/8
Hartsville No. 12													1082.0	176.83	1 3/8
Vandiver's Heavy Fruiter													1140.7	116.78	1 1/16
Huffman													1279.3	119.15	1 1/16
Coker's Pedigreed Cleveland													1223.9	128.30	1 1/16
Cleveland 37w-54													1310.6	133.73	1
Smith's Cleveland													1328.8	131.14	1 1/16
Express 122-433													1291.6	131.95	1 3/16
Acala No. 5													1008.1	140.78	1 3/16
Cook 588													1088.2	110.29	1

COTTON CULTURE.

Fertilizers—In all of North Mississippi, excepting parts of the Prairie and Mississippi Delta, where fertilizers do not pay, the use of from 200 lbs. to 400 lbs. of a high grade fertilizer per acre will be found very profitable. Fertilizers that will analyze from 10 per cent to 12 per cent phosphoric acid and 3 to 4 per cent nitrogen should be used. Where a large quantity of a leguminous crop is turned under, 200 lbs. of acid phosphate may be sufficient. A mixture of 200 lbs. cotton seed meal and 200 lbs. acid phosphate; or 100 lbs. nitrate of soda and 200 lbs. acid phosphate; are the most economical quantities of fertilizer for soils of ordinary fertility.

Apply all mixed fertilizers under the seed before planting. When nitrate of soda is used, it may be applied with the acid phosphate at planting time, or after first working of the crop. During wet seasons or when the crop is infested with coco grass, the latter method should be used. If cotton seed are soaked for a few minutes in a saturated solution of nitrate of soda and water and the seed dried before planting, good results may be obtained.

COTTON SPACE TEST.—FIVE YEAR AVERAGE.

Soil—Hill land slightly rolling.

Plots—Six rows each (except in 1920 when four rows were used), repeated from two to four times. Plots range in size from 1-20 to 1-4 acre each. An extra row, of which no record was taken, was grown between plots to regulate width of rows.

Three tracts of land were used in the five-year test. An average of about four hundred pounds per acre of a mixture of acid phosphate and cotton seed meal was used each year.

TABLE No. 2—Five Years' Spacing Results with Cotton.

VARIETY.	Width of Row in Feet.	Drill Space in inches.	Yield of Seed Cotton per A in 1916	Yield of Seed Cotton per Acre, for 1917	Yield of Seed Cotton in lbs. per acre for 1918	Yield of Seed Cotton in lbs. per acre for 1919	Yield of Seed Cotton in lbs. per acre for 1920	Five Year Average.
Triumph	3	9	1135					
Cleveland Big Boll	3	9	1290	652.5	1435	1608		
Sproull's Big Boll	3	9	1161					
Wannamaker Cleveland	3	9		594	1400	1503		
Columbia	3	9		405				
Sherard's Big Boll	3	9			1330			
Trice 270-41	3	9				1245		1151.4
Triumph	3.5	12	1304					
Cleveland Big Boll	3.5	12	1632	490	1216	1530		
Sproull's Big Boll	3.5	12	1326					
Wannamaker's Cleveland	3.5	12		502	1320	1380	1249.6	
Columbia	3.5	12		338				
Sherard's Big Boll	3.5	12			1140			
Trice 270-41	3.5	12				1740		1308.8
Triumph	4	16	1274					
Cleveland Big Boll	4	16	1467	513.9		1155		
Sproull's Big Boll	4	16	1158					
Wannamaker Cleveland	4	16		625.5		1272		
Columbia	4	16		388.8				
Trice 270-41	4	16				1050		989.4
Sproull's Big Boll	4	9	1255					
Cleveland's Big Boll	4	9		642.6	1107	1338		
Wannamaker Cleveland	4	9		609.5	1239	1272		
Trice 270-41	4	9				1272		
Columbia	4	9		422.6				
Sherard's Big Boll	4	9			1036			1019.3
Cleveland Big Boll	4	6		786				
Wannamaker Cleveland	4	6		777.6				
Columbia	4	6		693.1				752.2
Cleveland Big Boll	3	16		922.5	883	1050		
Wannamaker Cleveland	3	16		1057.5	1093	1032		
Sproull's Big Boll	3	16	1367					
Columbia	3	16		652.5				
Sherard's Big Boll	3	16			1032			
Trice 270-41	3	16				1152		1024.1
Cleveland Big Boll	4	12			1128			
Wannamaker Cleveland	4	12			1096			
Sherard's Big Boll	4	12			990			1071.5
Wannamaker Cleveland	3.5	6					1207.6	1207.6
Wannamaker Cleveland	3.5	18					1284	1284
Wannamaker Cleveland	3.5	24					1138.7	1138.7

Remarks—In the above table for 1917 when four-foot rows and six-inch space was used, the average was 752.2 pounds. To get a correct idea of standing of cotton so spaced compare the 752.2 pounds with the average of other plots for 1917. It will be seen to rank second in yield.

Conclusions—From the average results of five years it appears that land that, with fertilizer added, will produce an average of three-quarters of a bale of cotton per acre, should be planted in three-and-one-half-foot rows, and thinned to ten or twelve inches in the row. On land that will not produce this amount of cotton, three-foot rows and closer spacing will probably give best results.

COTTON DISEASES

Cotton Wilt—This disease seems to be confined to sandy or sandy loam soils and is more serious during wet seasons. No fungicide or fertilizer has been found that will prevent this disease as it is caused by a fungus growth that develops within the plant. The fungus may live in the soil for years. Crop rotation helps. The best known method for controlling this disease is to plant wilt resistant varieties. Seed from plants not affected when grown on infected soil, if selected may develop much better varieties for growing on infected soils.

Cotton Rust—One hundred pounds of Kainit per acre, checks black rust in cotton very materially.

TABLE No. 3—Thirteen Years' Results from Fertilizers Under Cotton.

Plot No.	200 lbs. Fertilizer per Acre.	Eight-yr. average in lbs. as reported in Bul. No. 165 this Station	Pounds of seed cotton per acre 1914	Pounds of seed cotton per acre 1915	Pounds of seed cotton per acre 1916	Pounds of seed cotton per acre 1917	Pounds of seed cotton per acre 1918	Thirteen year average in pounds of seed cotton
1	Check	464	670	350	590	390	525	474.5
2	200 lbs. Cottonseed Meal	824	940	700	960	780	600	810
3	200 lbs. Acid Phosphate	1000	1170	880	840	740	701	933.2
4	200 lbs Kainit	584	760	590	580	540	620	601
5	Check	487	654	500	680	530	570	536.5
6	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	948	1110	830	880	800	635	899.5
7	100 lbs. Cottonseed Meal 100 lbs. Kainit	714	760	440	680	620	650	702.6
8	100 lbs. Acid Phosphate 100 lbs. Kainit	838	950	670	860	600	570	784
9	120 lbs. Acid Phosphate 40 lbs. Cottonseed Meal 40 lbs. Kainit	843	940	594	540	580	415	726.5
10	Check	468	560	360	460	460	430	461
11	150 lbs. Cottonseed Meal 50 lbs. Acid Phosphate	779	930	430	640	710	465	707
12	100 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	799	980	570	640	625	465	727.5
13	50 lbs. Cottonseed Meal 150 lbs. Acid Phosphate	801	840	600	480	660	490	707.5
14	Check	481	540	420	290	320	390	436.5
Plot No.	400 lbs. Fertilizer per Acre.							
1½	Check	435	580	340	540	400	475	461
2½	400 lbs. Cottonseed Meal	736	670	540	920	640	610	706
3½	400 lbs. Acid Phosphate	821	1340	860	820	750	545	843.2
4½	400 lbs. Kainit	598	640	390	600	565	600	578.5
5½	Check	555	420	430	765	600	500	540
6½	200 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	1070	1310	870	1000	940	600	1007
7½	200 lbs. Cottonseed Meal 200 lbs. Kainit	858	1060	900	790	765	860	856.5
8½	200 lbs. Acid Phosphate 200 lbs. Kainit	999	1040	740	680	500	520	847.5
9½	240 lbs. Acid Phosphate 80 lbs. Cottonseed Meal 80 lbs. Kainit	1045	1190	760	610	590	500	887.5
10½	Check	445	540	350	460	440	530	454.5
11½	300 lbs. Cottonseed Meal 100 lbs. Acid Phosphate	1059	1280	760	940	1000	625	990
12½	200 lbs. Cottonseed Meal 200 lbs. Acid Phosphate	1030	1010	720	760	970	725	943.5
13½	100 lbs. Cottonseed Meal 300 lbs. Acid Phosphate	760	930	490	450	660	535	686.5
14½	Check	430	500	360	260	410	415	409.5

Remarks on Table 3.

Plots—Plots were located in the field as indicated in table. The plots were 1-20 acre each, 6 rows 4 feet wide, and 92 feet long.

Soil—Brown loam hill land.

Conclusions—Applications of both nitrogen and phosphorus are beneficial; 200 lbs. cotton seed meal and 200 lbs. acid phosphate per acre have given best results.

EIGHT YEAR VARIETY TEST WITH CORN.

Soil—Brown loam valley land.

Plots—One row plots repeated five or six times, containing from one-twentieth to one-tenth an acre each.

Fertilizer—From 300 to 400 lbs. of cotton seed meal and acid phosphate mixed and applied under the seed. Two crops of crimson clover and two crops of wheat and vetch were also grown on the land during the past nine years.

TABLE No. 4—Eight Years' Variety Test with Corn.

NAME OF VARIETY.	Planted May 17, 1912	Planted April 5, 1913.	Planted May 14, 1914	Planted June 14, 1914	Planted April 19, 1915	Planted June 16, 1915	Planted June 16, 1916	Planted April 18, 1917	Planted May 5, 1919	Planted June 9 1920; yield in shelled corn, per acre; bushel	Actual Yield in pounds per plat.	Per ct. of shelled corn per bushel.
Tennessee Red Cob	52.0		80.5	50.2	55.1	33.9	26.8	34.2	56.2	61.11	255.5	75.0
N. C. Prolific (Home Grown)		48.0	78.0		54.4	63.6	30.8					
Batt's Prolific	58.3	52.0	67.0	45.9	52.2	48.1	30.8					
Cocke's Prolific	51.2	53.9	87.0	48.7	51.2	47.3		34.7	80.4	41.86	233.0	75.7
Florida Flint	53.4	39.6	74.7	38.4	49.8	38.4	28		62.8	45.24	241.5	72.9
Davis' Poor Land Corn	54.6	49.8	75.0	50.2	49.1	43.6						
Vardaman's Stooling Corn		57.8	79.0	53.7	48.6	42.0	23.6	31.6	67.0	34.49	210.5	84.0
Reid's Yellow Dent					46.9	34.4						
Mosby	54.0	43.0	75.5	53.5	46.8	40.9	31.8	30.2		38.72	218.5	78.5
Mosby (Woodruff's)							33.6		71.2	43.19	228.0	79.2
Alexander's Six-Ear					46.6	36.7	26.6	33.2				
Boone Co. White	45.5	47.1	65.5	41.0	45.8	41.4	30.4	29.6				
N. C. Prolific					43.8	49.6		33.6	67.7	34.99	217.5	82.6
Rockdale	54.0	36.7	60.8	37.0	38.4	22.9		19.7				
Goliad						46.3		33.9				
Johnson's Prolific						36.1			62.6			
Marlboro	63.0						34.4	40.5	65.7	50.20	240.0	72.2
Hickory King							30.0			49.53	217.5	73.6
Neal's Paymaster							44.0		69.2			
Alabama Expt. Station Yellow							30.5					
New Era			73.9	45.5								
Hasting's Prolific	51.2	47.1	77.5	47.0	45.8	47.7	25.8	32.0	61.6	42.04	207.0	77.8
Mosby Rhodes			83.3	43.3					66.9			
Leaming		30.5	54.4	34.0								
Munson	57.9	47.1	73.0	50.0								
E-1	56.2	49.4										
Jones' Prolific		49.4	92.2	48.1	46.2	46.7	38.2			39.95	237.5	76.4
U. S. D. A. No. 195								34.2				
Williamson								47.3				
Johnson Co. White								38.4		46.99	236.0	75.7
Jones' Vardaman									60.4	39.99	236.5	84.0
Simmons' Prolific								65.7		49.07	230.5	73.6
Ferguson's Yellow Dent								44.0				
Sure Cropper								70.1				
Giant Tennessee Red Cob								87.5				
Paymaster (Station)								73.7		51.92	249.5	79.9
Mosby-553										41.61	217.5	77.8
Paymaster (Harpeth)										61.63	275.0	73.6
Tennessee Red Cob-72										57.60	242.5	72.2
Garric										46.43	223.0	67.4

It may be seen in the foregoing table that the prolific varieties in most instances have given the highest yields; such varieties as Cocke's Prolific, Mosby, Hastings, North Carolina Prolific, Jones Prolific, Vardaman, and Davis Poor Land Corn. In the past few years, selections from Tennessee Red Cob, a large eared type, have been taking the lead. Neal's Paymaster, Station Paymaster, and Tennessee Red Cob are illustrations.

SEED CORN.

Every farmer should, as far as possible, select his own seed. If he finds that he has not the best variety and cannot obtain good, sound seed from his own farm, he should buy his seed from some good seed breeder in his own section, and not send to some distant state for it. This is particularly true of northern and western grown seed. Seed of the above mentioned varieties that has been grown and selected by a good breeder anywhere in the southern states, especially east of the Mississippi river, will give good results in this section. The planting of early varieties of corn, especially where the seed has been obtained from the northern states, should be discouraged. These varieties are always low in yield, and the quality of the grain is poor. Many farmers in order to get some early feed, plant these early northern grown varieties. Every farmer who has been attempting to grow these varieties, knows that they are very inferior, and as a usual thing, he never tried them the second time.

FERTILIZERS FOR CORN.

The use of commercial fertilizers under corn has not been a very paying investment as is indicated by the majority of the fertilizer experiments conducted at this Station. Nitrate of soda, or nitrogen in some form, applied to the crop at planting time, or after the first working, has given the best results. The inability of soil, deficient in humus or organic matter, to retain the proper amount of moisture is the greatest limiting factor in producing large yields. When legumes have not been grown and but little acid phosphate used on previous crops, apply from 150 lbs. to 200 lbs. acid phosphate and 75 lbs. to 100 lbs. of nitrate soda per acre, or its equivalent in other forms of nitrogen. Apply acid phosphate before seed planting and nitrate of soda after first working on top of the soil near the plants. If other forms of nitrogen are used, such as cotton seed meal, or high grade tankage, it may be applied with the phosphate before planting.

From results indicated in the fertilizer tables, it appears that corn planted in five-and-one-half, or six-foot rows and left thick enough in the drill to make up for the extra width, and the middle between the rows planted either to soy or velvet beans, has given good results. Such a method does not reduce the yield of corn and the beans make a better growth. This plan gives the beans as an extra crop. Use 200 lbs. per acre of acid phosphate under the beans for the best results.

Probably the most economical results are obtained, when only nitrate of soda, or some other readily available nitrogen is used. If nitrate of soda is used, 100 lbs. to the acre applied at the time of planting, or at the time the corn is given the first working, seems to give the most economical returns. However, we know that these soils are deficient in phosphorus and applications of acid phosphate, mentioned above, usually give paying returns.

SWEET POTATOES—FOUR YEAR VARIETY TEST.

Soil—Brown loam hill land of ordinary fertility.

Plots—One row each repeated five times. Three different plots of ground were used in the tests.

Rows—Three and a half feet, plants eighteen inches apart in the row. It was necessary to do some replanting each year to secure a good stand.

Fertilizers—An average of 200 pounds of cotton seed meal and 200 pounds of acid phosphate per acre was used each year. A larger quantity may be advisable.

TABLE No. 5—Four-Year Variety Test—Sweet Potatoes.

VARIETY.	Yield in bushels per acre in 1913	Yield in bushels per acre in 1915	Yield in bushels per acre in 1916	Yield in bushels per acre for 1920	Four y'r average per acre in bush.
Triumph	224	336.9	229	384.5	293.6
Dooly Yam	144	301.4	148	193.4	196.7
Gold Coin	170	300.6	250		240
Porto Rican Yam		299.5	206	338.6	281.4
Nancy Hall	173	290.5	188.4	309.8	240.4
Southern Queen	109	283.3	167.2		186.5
Bunch Yam	166	237.5	128		
Common Running Yam	66	133.6	148.4		
Spanish				173.8	

The sweet potato is one of the best money crops in the loam and sandy soil of the State. It is one of the few plants that will make fair yields on thin land. With a proper knowledge of the diseases that attack the plant, and how to grow and handle the potato, it should be a rival with cotton on many farms in the State. Every farmer should grow at least enough for the farm. The demand for the sweet potato is growing rapidly as it is becoming better known in the northern markets. It should be an easy matter to have sweet potatoes for the table at least eight months in the year, and it is not out of the question to have them every day in the year.

Culture—While the sweet potato will make a fair yield on thin soil, a much larger yield can be had from a better grade of soil. From three to three-and-one-half foot rows may be used according to the soil's fertility, and plants from twelve to eighteen inches apart in the row according to the variety grown. Such varieties as the Triumph that grow very large potatoes, should be planted close together in the row.

Diseases—Black Rot is the most serious disease that attacks the sweet potato in the State, and, no doubt, is the cause of the greatest loss sustained by the grower each year. It appears in dark patches on the surface of the potato; and may also be seen upon the base of the young slips before they are set out.

The Potato Wilt or Stem Rot is also a serious disease attacking the sweet potato, but is not very prevalent in the State. This disease is caused by a fungus that lives in the soil and enters the plant through the roots. Soils once infected remain so for several years.

Dry Rot is a storage rot and not a field disease, as is thought by many. The storage house should be thoroughly disinfected while empty.

Remedies—Secure, if possible, seed potatoes grown on land free from the above diseases. Crop rotation is necessary in both cases. Seed treatment cannot be advocated as a remedial measure for stem rot, since the disease is internal and cannot be reached by any disinfectant From sets planted on non-infected soil, make vine cuttings and plant these cuttings on soil where potatoes have not recently been grown.

In case you cannot secure potatoes you know are free from disease, select only those that are sound Take vine cuttings early and plant as above. To prevent disease from entering the farm bed the potatoes and grow the crop on land where no plants have been grown for several years. Infection is easily obtained from the potato bed.

HARVESTING THE SWEET POTATO.

The potato should be dug before the vines are killed by frost. Remove the vines by the use of a common hay rake. A common method is to bar off both sides of a row with a turning plow and throw the balance of the row out with a middle buster. The potatoes should be assorted in the field using great care to prevent bruising. They should be gathered in hampers or boxes and assorted as gathered and stored in frost proof potato houses, arranged for proper ventilation, or placed in properly ventilated bins.

Several weeks before potatoes are dug the potato houses should be cleaned and sprayed with a solution of formaldehyde and water, 1 pound to 30 gallons of water, and allowed to dry out thoroughly, before using.

Curing the Potato—A fire should be started in the stove of the potato house the day before harvesting begins, and the stove kept hot each day with all ventilators open, while digging is in process. The house may be closed at night unless the weather is dry and warm. After the potatoes are harvested the stove should be heated so the thermometer will register 80 degrees to 85 degrees F., with as much ventilation as possible to get the desired heat. In two to three weeks the potatoes should be sufficiently dried out. The time required will depend upon the weather to some extent. The house should be kept around 55 degrees all the winter, and would be best for it not to vary more than 10 degrees either way.

Many growers have no trouble in keeping potatoes in the old style, potato bank, or house.

Securing seed potatoes free from diseases, harvesting before the frost kills the vines, handling carefully without bruising, and getting rid of the excessive moist-

ure as soon as possible after digging and preventing them from freezing in winter, is the entire secret in keeping the potato almost any length of time.

PASTURES.

The best pasture combination for this region is lespedeza, bermuda grass, white and southern bur clover. After the soil has grown this combination for a few years, blue grass can be easily introduced. On the lime soils red and alsike clover may also be used. On fertile soils bermuda grass can be easily grown from seed. Five pounds of seed per acre, sown on a well prepared, firm seed bed about the middle of May, will give good results, if the weeds are kept down by mowing, and the stock kept off until the plants get a good start. On thin soils it is much safer to sod the bermuda. This can be done at almost any season of the year. The most satisfactory time is during the open weather in mid winter. The only precaution necessary, is to prevent the sod from freezing after it has been dug. This can easily be accomplished by digging the sod and planting the same day, being careful to cover it so it will not freeze. During this season pastures are idle, farm work is not rushing. When the pasture season arrives, the productiveness is reduced very little.

Fifty Acres Sodded to Bermuda Grass in Mid-Winter—During the winter of 1915-1916, a fifty-acre pasture of lespedeza on the Station farm was sodded to bermuda grass. The land was not broken broadcast, only furrows were opened six feet apart. The bermuda sod was turned shallow with a double horse plow and chopped into blocks about two to three inches square, hauled in wagons and dropped in the open furrows about two feet apart, and covered deep with a double horse plow. No more furrows should be opened, or sods dug, than can be covered the same day. Where this plan is followed, it is easy to begin work a few hours after a rain, or even when the soil is slightly frozen, with but little damage to the soil. During the latter part of February or early March, after danger of a heavy frost was over, these ridges or rows were cut down with a small disk harrow, and the land smoothed with a section harrow. This method brings the bermuda sod near the surface, and also exposes the lespedeza seed so they will germinate at the proper time. The cost of doing this work, estimating the labor at $1.00 per day, was four dollars per acre for labor alone. This method has proven very satisfactory in securing a bermuda pasture. Land thus sodded four years ago is now about solid in bermuda grass, and will easily carry double the amount of livestock, per acre.

Seeding Pasture to Bur Clover—The most satisfactory method we have found for seeding pastures to bur clover, is as follows: During the latter part of August run furrows six feet apart with a shovel plow, lap two furrow slices on this furrow with a small turning plow and harrow the ridge flat. During the latter part of September, after a rain, place seed in a sack, and rinse in clean water, thus inoculating the water, then put sack containing seed in boiling water one minute, and then return to the first water used, to re-inoculate the seed. A small quantity of soil from a bur clover field, or from an alfalfa or melilotus field can be mixed with the seed to make sure of perfect inoculation. The seed may be planted with a common cotton planter, set as for planting cotton. In our experiment the seed germinated in a few days, and in two years the pasture was solid in bur

clover. If the land is thin it is advisable to use an equal mixture of cotton seed meal and acid phosphate, at the rate of 200 lbs. per acre, in the first furrow opened in preparing the seed bed. This will give the clover a good start, so it will be better able to stand the winter freezes. Land planted to grasses and clovers mentioned above will easily care for four times as much stock, per acre, for a much longer grazing season each year, than the common pastures found in this section. On account of dry weather in the fall, some years, bur clover on poor pasture land may not germinate early enough to withstand the winter. Where the land is cultivated no trouble of this kind may be expected if the clover was grown on the land the year before.

Black Medic experiments are giving promise. Indications are that this plant will grow best where additions of lime are made. If it can be successfully grown without very much expense, it will prove a most valuable plant for this section, as it is easily scattered over lands by stock and furnishes late fall, early spring and summer grazing.

Crimson Clover—Crimson clover is a most valuable winter legume for the non-lime section of the State. While the plant responds readily to the use of lime, it grows well without lime. With the exception of wet land, it adapts itself to almost any character of soil in the State, not deficient in vegetable matter. Many farmers have failed with this plant on account of seeding very thin and poorly cultivated clay land late in the season, land so thin it will not make a paying crop of any kind, and as a result, the plants are lost the first freeze. The chances for growing this clover on thin land are very much increased by early planting, say by the middle of September if there is sufficient moisture in the soil, by heavy inoculation, and by the use of fertilizers. An application of ten tons of stable manure per acre, on the spring crop, has enabled this Station to succeed in growing clover the following fall on land that failed the year before. The growing of velvet beans, cow peas, soy beans, or lespedeza will have a similar effect. A firm seed bed that has been well cultivated during the summer, regardless of the kind of crop grown on the land is ideal. Cow pea stubble disked and harrowed thoroughly, and planted after a rain, gives very satisfactory results. It is a mistake to turn under a heavy amount of vegetable matter in the fall and then attempt to seed to crimson clover. If the vegetable matter is turned under the latter part of July and disked, harrowed and rolled, and then harrowed after the roller and after each rain until the seed are planted, results should be satisfactory.

Cut No. 2 shows crimson clover growing between cotton rows. This clover was planted the latter part of September in the cotton middles, and was covered by a shallow cultivation of the cotton. About 50 lbs. per acre of home grown seed in the hull was sown. The cotton made an average yield of 2150 pounds of seed cotton per acre. This photo was taken April 12th, 1916. The clover was turned April 16th, and prepared for planting in cotton. It is advisable to either turn clover sod earlier, or to follow with corn or some other crop besides cotton. Cotton must get an early start to be profitable.

Cut No. 2. CRIMSON CLOVER

Time for Planting—After a rain from the middle of September to the middle of October, in this latitude. We have had the best results planting about the 25th of September. Home grown seed have proven more satisfactory than any we have been able to buy Where only the middles between the rows are to be planted, 12 to 15 pounds of clean seed per acre should be used. Where the land is to be seeded broadcast 18 to 20 pounds is sufficient. Where seed in the hull are used about double the number of pounds given for clean seed are needed.

Inoculating—Excepting lime soils, any land seeded to clover for the first time, should by all means be inoculated. The cost in time and money amounts to almost nothing. Dissolve one quarter of a pound of common glue in hot water, moisten the seed with the glue water, then add about one half pound of soil from a well inoculated field of clover to each pound of seed and mix well. The seed should be covered promptly after sowing.

Harvesting the Seed—When the heads have turned brown and the seed are easily removed, they should be harvested. As the seed shatter off very easily, much care should be exercised to prevent a loss. Cutting with a mowing machine and using a common oat thrasher run at low speed gives fair results, but does not remove all of the hulls, nor can all the seed be saved. In a small way the seed can be saved by hand stripping, or by the use of what is known as a seed stripper. It will be hard to save more than 50 per cent of the seed with the strippers, but even with this loss enough seed can be saved from one acre, with very little expense, to plant ten or more acres.

Crimson clover makes as good a quality of hay as can be found, if cut just before full bloom and cured properly. In this latitude, it is usually ready to cut about the middle of May, a very busy season with most farmers. We look upon the plant from a grazing and soil building standpoint alone, and feel that it has few equals as a winter legume if properly grown.

Why We Should Grow Crimson Clover—It grows in the fall and early spring, occupying the soil when not needed for the ordinary farm crops. It prevents soil washing, to a certain extent, during the winter months, if the land is properly terraced. When sufficient early fall growth is secured, it furnishes late fall and early spring grazing for all kinds of livestock. It utilizes nitrogen from the air, and gathers some from the soil, that would otherwise be lost by leaching. When turned under it adds organic matter equal in value to ten or more tons of stable manure, depending upon the growth obtained. The cost of seeding is very small in comparison with the results obtained.

Velvet Beans—The Velvet Bean is one of the greatest summer legumes. The plant will adapt itself to almost any character of soil in the State, and can be especially recommended for building up thin soils. In this section of the State it should not be grown for seed, but as a soil restorative crop, as but few seed will mature unless planted very early. The seed may be planted after grain or some other crop, or in corn. Better results will be had if planted with some crop that will support the vines. To get the best results the seed should be planted as soon as danger of frost is over, and the soil has begun to warm up, which will be about cotton planting time. A common method is to plant two rows of corn and one of beans. It is far better to make heavy planting of beans, and to secure the best of seed that can be had, as poor results are too often had from the planting of poor seed. Use not less than one peck of good seed per acre After frost the velvet bean and vines furnishes fine grazing for livestock.

Two-Year Rotation.

First Year—Cotton, with vetch planted in middles at last working.

Second Year—Corn, after the vetch has been harvested which is about June first.

About one-fourth bushel per acre of either Hairy or Spring Vetch, may be sown, prior to last cultivation of cotton. After proper season begins in the fall, the vetch will germinate and make some growth before cold weather. It makes its heaviest growth in April and May, maturing the latter part of May. The first year the vetch should be allowed to mature fully, the vines turned under, and the land seeded to corn. The following spring when this land is being prepared for cotton the vetch seed will be turned to the surface. In September when cultivation is finished, these seed will germinate. After the first year the vetch may be harvested for hay as soon as a few seed have matured. The seed shatter out easily and will leave plenty of seed on the land to furnish volunteer vetch every other year. Such a method will furnish three crops in two years, and will greatly assist in building up the soil. Hairy Vetch is hardy and if it gets an early start will stand our coldest winters. Vetch is the surest winter legume we have found. The cotton stalks should not be cut, as they furnish support for the vines, which is very desirable.

In the non-lime soils vetch is a little hard to get established. A small quantity of stable manure works like magic. Two tons of crushed limestone per acre will more than double the yield.

TABLE No. 6—Lime and Fertilizer Test with Cow-Peas.

Plots 1-20 acre each. Planted May 27, 1915.

Peas were picked by hand before the vines were cut. Some of the leaves were lost before the vines were cut. Vines were cut October 15.

Rows 30 inches apart, with one row skipped between plots.

Variety of peas used was Brown Whipporwill.

No.	VARIETY OF FERTILIZER.	Bushels peas per acre	Pounds of hay per acre
1	No Fertilizer	11.6	2380
2	500 lbs. Air slaked lime	16.9	3480
3	200 lbs. Basic slag	16.6	3200
4	200 lbs. Phosphate rock	18.8	2380
5	200 lbs. Acid phosphate	20	2680
6	No Fertilizer	15.3	2000
7	500 lbs. Crushed lime stone	18.6	2560
8	2000 lbs. Air slaked lime	23.6	3040
9	500 lbs. Rotten lime stone (lump) not crushed fine	17.7	2720
	A second planting made June 1915, with same size plots as above. No peas were picked from this planting.		
1	4000 lbs. Uncrushed rotten lime stone		4280
2	No lime		3740
3	Crushed lime stone rock		4740

TABLE No. 7—Lime.

Soil—Valley land of ordinary fertility.

Plots—1-20 acre each, 24x92 feet.

Lime—Applied to land before seeding in 1912.

Planted—September 15, 1912. The 1916 planting of oats and vetch did not germinate until very late and was winter killed.

Crops Planted—Oats and vetch mixed, at the rate of two bushels per acre. The 1912 planting of oats and vetch was harvested the latter part of May, the land turned and seeded to corn.

The 1916 planting of oats and vetch that was killed was followed with corn planted May 10, 1917.

Number	KIND OF LIME.	Yield in Pounds of oats and vetch hay 1912	Yield of corn in bushels 1912	Yield of corn in bushels 1917
1	No Lime	2140 lbs.	18.3	28.4
2	4000 lbs. Crushed lime stone	2860 lbs.	24.7	63.8
3	2000 Air slaked lime	3560 lbs.	29.7	55.5
4	No Lime	2560 lbs.	21.4	38.8

Remarks—Lime is not a fertilizer. It sweetens the soil and encourages the growth of bacteria that forms the nodules on the roots of leguminous plants, thus enabling the plant to take nitrogen from the air. It also assists in floculating the soil and liberating some of the mineral plant foods.

Conclusions—It appears that the air slaked lime was more active at the start, and that the crushed stone gave better results later. In the limed plots the vetch settled down on the ground more than on the unlimed plots, as the growth was more than double, and in harvesting the crop much more vetch was left on the soil. This, to a large extent, accounts for the increased yields of the plots that were limed. More of the legume was turned under each year.

Alfalfa.

Alfalfa will grow on almost any character of soil in this section of the State, if four or five tons of crushed lime stone is applied per acre. Only fertile, well drained soils will give satisfactory results. Fall planting is more satisfactory if the season for planting is favorable; if not, the planting should be made in the spring. Twenty-five pounds of the best seed that can be had should be planted per acre. The soil should be inoculated (see method under crimson clover) by using soil from an alfalfa field. If fall planting is to be made, the soil should be prepared about the first of August, limed and fertilized if desired, harrowed and rolled, with harrow following the roller. A firm seed bed is necessary and the soil should not be turned again before planting which should be made after a good rain in the latter part of September. The disk and smoothing harrow should be used on the land after preparation is made as soon as possible after each rain to preserve the moisture and destroy the weeds and grass. Only the section harrow will be necessary for covering the seed when planted.

Alfalfa is one of the most profitable legumes that can be grown. It will furnish a most excellent hog pasture if mowed every thirty days during the summer, and not grazed too closely by the hogs. Very close grazing will destroy the plant, No farmer would make a mistake to plant a small acreage, say about one acre, for the hogs and poultry of his farm.

A variety test is now being made to ascertain the variety best adapted to this section. Seven varieties are employed in this test. The planting was made last spring and but little data has been secured at this writing. The extremely hot weather the past season was unfavorable for the growth of alfalfa, and favorable for the growth of weeds and grass.

DAIRYING.

This section of the State is especially adapted to dairying. There is a large amount of waste land on almost every farm, that, if utilized for pasture for good dairy cattle, could, in all probability, be made more profitable than if used in any other kind of farming. Marketing facilities are good; creameries and milk markets are within forty miles in any direction.

These lands are especially adapted to the growth of grasses and forage crops.

Labor is plentiful and cotton cheap.

Legumes grown to keep up soil fertility can be fed to the dairy cow and the manure returned to the farm; the dairy cow being used to market all surplus feed grown on the farm.

Winter cover crops that should be grown on all cultivated land in the hill section of the State can be grazed in the fall and spring to an advantage.

On account of mild winters, inexpensive barns can be used.

The grazing seasons are longer and greater tonnage of forage, on fertile land, can be grown than are now grown in the more favored dairy sections of the United States

The best dairy market of the country at present is in the South. Dairying furnishes employment the whole year around.

Then why not more dairy farms in this section? The South has been too loyal to "King Cotton," and her loyalty has resulted in poor lands, and, of a necessity, a poor people.

The Station dairy was installed in August, 1909, with cows selected from this county. The dairy has been used as a demonstration purely, and not for experimental purposes. The Central Station dairy is engaged in such work.

For four years, as reported in Bulletin No. 165, an average of $110.00 gross, and $65.00 net was made for every cow in the dairy. These results were obtained before the war and were more than doubled during the abnormally high prices that have prevailed the last few years. Such prices cannot be expected to continue for an extended period of time.

Three money crops are considered the maximum number for profitable farming. This does not include crops to be utilized on the farm. Cotton growing should be one farm industry, and we think dairying and sweet potato growing could easily be made two other profitable ones where marketing facilities are good. Four things are necessary for profitable dairying: good cows, plenty of the right kind of feed, a good market, and the man. We are inclined to think the last named should be first—"the Man." A good man will get the cows, and grow the feed, and find the market.

An inexperienced man should grow into the dairy business. Start with the cows on hand, and weed out and secure more profitable cows as means will justify.

It will be just as hard to make a success dairying, and buying all the feed, as it is to make a success growing cotton and buying all the supplies for the farm.

The Station averages about twenty cows in the milk barn at all times. One darkey uses the milking machine and strips all the cows, cleans the barn and milking utensils; in fact, does all the work of the dairy. The dairy does not in any way interfere with farm work, but on the other hand, furnishes a market on the farm for all surplus food and keeps up the fertility on the farm.

More cotton and sweet potatoes could be grown on a dairy farm properly managed than the same farm would grow without the dairy. In fact, the growing of livestock is one of the essentials of successful agriculture, and the dairy cow should head the list in this section.

Bulletin No. 194 December, 1920

REPORT FROM SOUTH MISSISSIPPI BRANCH EXPERIMENT STATION

FOR 1918 TO 1920 INCLUSIVE

By E. B. FERRIS

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REPORT OF WORK AT SOUTH MISSISSIPPI EXPERIMENT STATION FOR 1918, 1919 AND 1920.

By E. B. FERRIS.

Introduction.—The legislature of 1918 authorized the removal of the McNeill station from McNeill to Poplarville and in order to make the name of the station more suggestive in its new location, we have changed it from McNeill Branch Experiment Station to South Mississippi Branch Experiment Station. The act authorizing this change of location stipulated that we might sell the land at McNeill in excess of five hundred acres and that we should turn over to the Southern Pine Association five hundred acres with the buildings and improvements thereon. A conditional agreement had previously been made with this association and the Southern Settlement and Development Organization of Baltimore whereby they would take over and jointly finance the work at McNeill as a demonstration farm for the entire Coastal Plains Region of the South. On account of the war and the taking over of the railroads by the government, the Southern Settlement and Development Organization, financed largely by these railroads, could not put up their part of the necessary funds and as the Pine Association could not finance it alone, we were left to make new arrangements or abandon the property at McNeill entirely.

In deciding on the advisability of taking over this work at McNeill these two organizations had engaged the support of several experts from the U. S. Department of Agriculture as advisers and these experts were so impressed with the importance of continuing certain lines of work already started at McNeill that when this could not be done by private enterprise they agreed to help finance it with Federal funds. The result was that the Bureau of Animal Industry sent an expert to McNeill to take active charge while the Bureau of Plant Industry moved its plant work from Biloxi to McNeill and it is all being carried on under the name of the Coastal Plains Branch Experiment Station. This station is now being run under the immediate direction of Mr. S. W. Greene, an expert from the Bureau of Animal Industry while the plant work was done under the direction of Prof. S. M. Tracy until his death recently. The new station at McNeill will specialize on beef cattle and sheep, the handling of pastures for same and the introduction of new grasses and forage crops most likely to make the profitable utilization of cut-over lands a possibility. Our station left at McNeill the beef cattle and sheep with which this line of work had been started and is now cooperating with them in every way possible to make their work a success.

The location of the station at Poplarville is on one hundred acres of land within the corporate limits of the town and just across the road from the Pearl River County Agricultural High School. This land was donated by the county and had been used by them first as a convict farm and more recently as a home and farm for the county paupers. This farm was in a fairly good state of cultivation; was well fenced on the outside and had several substantial buildings on it; a five room cottage; large horse barn; and a home for the paupers consisting of four large rooms built in line with

stack chimneys placed so to give a fire place in each room, and an entrance porch running the entire length of the building and covered with the same roof. This last building has since been cut in two parts and moved so as to have a frontage on the public road and converted into two 5-room tenant houses that are both attractive and comfortable. The cottage is now used as a home for the foreman and the mule barn, by the addition of two sheds, is furnishing shelter for all work animals, and storage space for hay, cotton, fertilizer and farm implements as well as shelter for dairy cattle in winter.

The bill authorizing the removal of the station from McNeill to Poplarville was not passed until the last days of the legislative session of 1918 and even though we had been ready at that time to move every thing to Poplarville it would have been too late to start many experiments. As it was, the place at Poplarville was not ready to take care of our livestock nor to house the station employees. The paupers were still in the home and the keeper in the cottage and could not be moved until the end of the year. At McNeill, too, it was necessary to do a lot of work before perfecting the arrangement whereby the property was finally turned over to the present management and although we took charge at Poplarville soon after the bill was passed, only a few experiments were started that year. No experimental work was done at McNeill in 1918 except to keep in progress certain work with pastures and livestock that we hoped to have our successors continue.

No means were provided by the legislature for paying any expense of removal of the station except we were authorized to sell any land in excess of 500 acres and use the money at Poplarville. A section of land near McNeill was exchanged for a section near Poplarville and we got $1000.00 difference, several scattered tracts of wild land were sold for amounts approximating $2000.00; and these two sales with the sale of surplus dairy cattle that could not be used at Poplarville gave us a fund of some $5000.00 in addition to the regular support fund with which to run both places, the one at Poplarville for two years and the one at McNeill for fifteen months, and in addition put up such buildings at Poplarville as were absolutely necessary to house the employees and the dairy cattle. This, too, in face of the fact that the purchasing power of the dollar was fast approaching the low mark it finally reached.

In the spring of 1919 a 20-cow dairy barn was built at Poplarville after plans furnished by the Dairy Division, U. S. Department of Agriculture. This has concrete floors and troughs thruout, iron stalls and stanchions, glass windows, and milk and feed rooms under same shelter, being built at a cost approximating $1500.00. An 8-room bungalow with attached pergola was built as a home for the assistant director at a cost a little in excess of $4000.00. The arrangement of the entire farm was changed at this time so as to better protect it against surface erosion, to give fields either square or rectangular in shape so as to more easily figure the contents of small subdivisions, to place the lands to be used for pasture so as to give drinking water as well as to put the more rolling lands to this use. Lands best suited to permanent experimental work were set aside for this

use and as nearly as we were able to do so plans were made in connection with such land that will make such experiments grow more valuable as the years increase.

The place as taken over by us had no water supply, not even surface wells, the ones that had been dug on it being then out of commission. A two inch pipe line was run about two thousand feet connecting with the nearest city pipe line and from this smaller pipe was run to all the buildings on the place as well as to two large concrete drinking troughs built for livestock.

While our successors at McNeill took charge in the spring of 1919, it was in July of that year before we got the last mentioned buildings completed at Poplarville so as to move the dairy cattle and furnish a home for the local director. The paupers had been moved off the place early that year and the foreman from McNeill had immediately moved in, while all office work had been done at Poplarville months before the final move in July had been accomplished. A good number of experiments were started in 1919 but on account of the newness of the land and the very unfavorable seasons, we report them with many apologies, feeling that alone no very positive conclusions may be drawn from them.

As stated, the support of our station for the years 1918-19 was very small considering the depreciated value of the dollar and the heavy expense attendant upon starting anew at Poplarville. This necessitated the strictest economy with absolutely no expression along any line. The succeeding legislature was much more liberal to the branch stations and under the new order of things we have already made many improvements and hope to make many more. We have always felt that the importance of horticultural crops in South Mississippi warranted the entire time of a well trained scientist in doing experimental work, but we were never before able to employ such a man. For years at McNeill a large part of the station work consisted in growing and marketing truck crops, still other details in the management of a branch station made it impossible for one man, even tho scientifically trained, to give the attention that so broad a subject demanded. Recently we have been fortunate in securing the services of Mr. F. B. Richardson as horticulturist for this station and he began active work on October 1st last. Mr. Richardson is not only a scientifically trained horticulturist, but has had a lot of practical experience both as a teacher and as a commercial grower of truck crops. For two years he has been extension horticulturist for the state of Mississippi and in addition to this work he reorganized the Mississippi Horticultural Society and is its present secretary. A great many experiments along horticultural lines have been planned and much of this work has already been started. Ten acres of the best land on the station has been set aside and fenced apart for this horticultural work and will be handled in an intensive way. This field was selected because of its superior air drainage which lessens the danger from frosts in winter and early spring, while in every other respect the fertility of said field is as good as the best on the place made so by having grown two successive crops of velvet beans thereon and having had these grazed off by dairy cattle and the wastes turned into the soil.

Mr. Richardson has taken over the work with sweet potatoes, a crop with which we have been experimenting here for two years along lines suggested by the association of Southern horticulturists and which included tests with varieties, work with fertilizers and experiments with digging and storing these potatoes. The storage feature of this work in 1919 was lost entirely as the house in which our potatoes were stored belonged to the Agricultural High School and was destroyed by fire early in the winter or just after the potatoes were put in. A 1200 bushel potato house has just been completed on the station, built according to the most approved plans, and in this house the crop grown here in 1920 has just been stored.

While there was ample room in the mule barn already here to store our corn, the rats and weevils were destroying so much of it that a rat and weevil proof crib was built this year in time to store the present crop. This crib was located entirely apart from the barn, built over high posts with thin tubs turned down over the tops of same so as to prevent rats climbing into the crib, has ventilators to permit of the proper airing of the corn, yet it is so constructed as to be nearly air tight with the closing of these ventilators in order that carbon bisulphide may be used in killing weevils. Practically all corn grown here is thoroughly infested with weevils while still in the field and unless treated against them soon after being stored will greatly deteriorate. Therefore all our corn has been placed in this crib, ventilators and doors stopped with paper and sacks and thoroughly treated with at least two applications of carbon bisulphide applied at intervals of two weeks.

On first moving our office work to Poplarville rooms in the old pauper home were used as an office and this was continued until May of this year when this building was divided and moved to other locations and converted into cottages for tenants. A new office building was constructed as soon thereafter as possible and located near the public road, convenient to the home of the local director and equally convenient to the proposed location of the residence of the station horticulturist. This office building is twenty feet square and is divided into a large room for desks and book cases, a long narrow room for storing bulletins, and a small closet for toilet and lavatory. We hope to make it serve not only as an office for the station staff, but for an entomologist to be located in South Mississippi under the control of the State Plant Board. It is hoped that we may have such a man stationed with us in future for we feel sure that the carrying out of such a plan would be mutually helpful to the station, to the Plant Board and to the varied interests of South Mississippi.

At Poplarville we have a little less than one hundred acres of land. This is not sufficient to give any considerable acreage to pasture, consequently we will not be able to do much work with livestock and this should not be necessary so long as this kind of work is continued at McNeill. Our work here with livestock will be confined to a few dairy cows and sufficient hogs to utilize the wastes of the place. We have now only about seven cows, all registered Jerseys, but had hoped by this time to have increased the number to twelve or fifteen which will be the maximum number we can keep. Last winter hemorrhagic septicemia suddenly appeared in our herd and in

a single day four of the best cows died. This will necessitate our buying additional cows or waiting until a number of heifers now on hand are developed. Two pastures of about twelve acres each are used for cattle and hogs. One of these pastures has been planted to carpet grass and the other to a combination of lespedeza and oats, the first for summer and the last for winter grazing. Seasons were ideal for pastures last spring, summer and fall and although we kept some fifteen head of cows and heifers and some twenty five head of hogs and shoats, we never lacked pasturage for them from early spring until frost and then velvet bean fields were available. These pastures and a nearby meadow planted to lespedeza have attracted more favorable comment from visitors than any work that has ever been done by us either at McNeill or Poplarville and was truly a source of much gratification to the management. The fact is, we have never seen a better pasture nor a finer meadow any where than was furnished here this year by lespedeza.

The shape of the station property is that of a rectangle with its north line extending one-fourth mile along the highway running from Poplarville to Bogalusa and its east and west lines running south three-fourths of a mile. The buildings are on the north end of the tract and a lane has been built north and south thru the exact center of the land from which to reach all subdivisions thereof. The land on either side of this lane has been fenced into ten acre blocks with gates entering each field from the central lane. It was one of these ten acre fields that was given over to the horticulturist. Another field adjoining the permanent pasture of oats and lespedeza, was set aside for hog crops and was subdivided into two parts, one half being limed and the other half unlimed. In 1920 this field was planted to chufas, peanuts, cowpeas, soy beans and lespedeza, each crop extending over limed and unlimed portions. Hogs that were grazed continuously on the permanent lespedeza pasture were in the fall turned on these crops as they ripened. We were not able to get any records of increased gains on account of having no scales on which to weigh the hogs. Platform scales had been ordered weeks before these crops were ready, but on account of congested freights in Chicago were not received until weeks after the last of these crops had ripened and been eaten by the hogs. It might be interesting to note that no one could tell by looking over the field any difference in yield of any crop grown on limed and unlimed portions of the field. It was on a part of this field planted to lespedeza last spring that the remarkable lespedeza meadow was located. Strange to say this was on the most broken part of the field, a part so uneven and gullied that we had purposely planted it to a crop that did not require cultivation.

This work of growing hog crops and lespedeza on this field will be continued indefinitely or until we get results showing the value of the several crops in pork production. This field and the one adjoining have just been planted to oats which hogs and cattle will be allowed to graze in late winter and early spring, or, until the oats are gone and the lespedeza is ready for grazing. Oats grown last winter on the lespedeza pasture above referred to were the best on the place and but for continuous grazing with cattle and hogs would have made respectable yields of grain.

Much work remains to be done here in leveling up portions of fields made uneven by surface erosion; in getting rid of stumps in the rougher lands devoted to pasture and uncleared when turned over to us; in removing hidden stumps poorly gotten out when the land was cleared; and in strengthening hillside ditches so as to prevent any further erosion. Considerable work was done last winter in blasting and burning stumps from portions of these fields and in clearing off logs and bushes from land too rolling for cultivation, but which we plowed and planted to carpet grass and hope to convert into first class pasture.

The explanations and tables following will give in more or less detail the principal experimental work that has been carried on at Poplarville during the years 1919 and 1920, certain work with cotton carried on here in 1918 and 1919 having already been reported in bulletin form in joint reports with the other stations of the state.

The soils here while apparently uniform in composition so far as the eye can tell, evidently vary greatly in productive capacity due in part to previous cropping and fertilization as well as to the removal of the soil by surface erosion. On this account many of the tests with fertilizers obtained up to this time have been seemingly contradictory and we can only hope that a continuation of such work will finally result in a gradual lessening of this trouble. So far we have found much greater variability in soils here than we found at McNeill where our fields were cleared from the original forest, had suffered no surface erosion and had never been fertilized nor cropped except as nature did it.

TESTS WITH FERTILIZERS UNDER COTTON AND CORN.

In the spring of 1919 six acres of the smoothest and most uniform land on the place was set aside for permanent work with fertilizers. This land had grown a crop of corn and velvet beans in 1918 and was in a fairly good state of cultivation, being what we consider the best type of pine land. This field was then laid off into sixty eight rectangular plats each 24 feet by 154 feet. The shape of the field made it most convenient to have the plats four tiers deep, the rows running east and west, so that in planting and cultivating the crops the rows were 627 feet long and ran lengthwise across four different tiers of plats. This land sloped gently toward the south and east and in order to avoid excess water during heavy rains running from one plat to another, the north and south divisions between plats were made into small drains in which this surplus water would accumulate and run out of the field. These sixty eight plats were then laid off into rows four feet wide, making each plant one-twelfth of an acre and while the six rows of each plat were fertilized alike, only the four inside rows were used in figuring the yields, so in weighing out the fertilizers for the several plats we multiply by twelve to reduce to an acre basis, but in figuring yields per acre the actual weights were multiplied by eighteen, thus we avoid any possible effects of fertilizers extending from one plat to the other and do away with the necessity of leaving idle space between plats.

In 1919 twenty eight of these plats were used for cotton and the same number for duplicate fertilizer work with corn, while twelve plats were left for fertilizer work with sweet potatoes. In all this work every third plat was left blank so that by the side of every fertilizer plat was a check plat for comparison. In 1920 we decided to use for cotton alone all the plats that had been used in 1919 for cotton and corn and to duplicate all the tests. As nearly as possible all plats in 1920 were fertilized exactly as they had been in 1919 with the exception that kainit was used thruout in place of Nebraska potash and calcium cyanamid in place of cottonseed meal. In most instances in figuring increases in yields due to fertilizers the yields were compared with the check plat nearest, or rather beside the fertilized plat in question, but in a few instances where we knew other nearby check plats to be more nearly alike the fertilized plat in natural fertility we have figured increases from these.

In 1919 Cleveland Big Boll cotton seed was planted on April 19 and we got a good stand. Many heavy rains interfered with the cultivation of the crop and the seasons thruout the entire year were too wet for growing cotton under any conditions, more especially with the boll weevil. No effort was made to poison the weevil in 1919, but the cotton was worked often and kept in perfect condition. As shown by the following table, the yields were almost nothing, the squares falling either from rain or weevils almost as fast as they were set.

In 1920 Trice cotton seed was planted on April 20, came up to a good stand, and before squares began to form at all numerous weevils were to be seen in the buds of the cotton. These were picked by children to as great an extent as possible, but on account of a scarcity and inefficiency of labor this work was necessarily poorly done. Beginning on June 22 this cotton was poisoned three successive times at weekly intervals with calcium arsenate applied with a hand gun in the early morning while the dew was on and the wind not blowing. At this season the weather was comparatively dry and the three applications were effective so far as not being washed off by rain was concerned. On adjoining fields we continued to poison after July 10, but rains washed off practically every application so that we saw no need for continuing the poison on this field. This cotton was cultivated lightly nearly every week, the object being to keep a dust mulch in which the weevils might be killed, but there was so much rain thruout both 1919 and 1920 that in few if any instances was there any dust. We were never able to find any dead weevils in the field as a result of the poisoning and cannot say that the increased yields in 1920 over 1919 were due in whole or in part to the use of poison.

We do know that there was a heavy infestation of weevils on this and all nearby fields in 1920, an earlier infestation than we observed in 1919, also that this and other poisoned cotton with us made much heavier yields than did other cotton in neighbors' fields while in 1919 our yields were much poorer than the average of the neighborhood. The difference in results between 1919 and 1920 was no doubt partly due to the difference in varieties used, Trice, in our opinion, being the best of the varieties under boll weevil conditions. However, Cleveland Big Boll, which in 1919 made ridiculously

low yields, in 1920 made in our variety work an average of 1155 pounds per acre while Trice made an average of only 1380, showing the difference not altogether due to variety.

It is our intention to continue this work with fertilizers on the same plats for a number of years, for in hundreds of tests made in the past it has been our observation that little can be learned from a single year's tests as to the real requirements of the soil.

TESTS WITH CARRIERS OF NITROGEN UNDER COTTON.

In the spring of 1920 one acre of land was set aside for permanent work with cotton and corn growing, but, clover and vetch during the winter months and during the regular crop seasons planting this land alternately to corn and cotton in an effort to maintain stands of these winter legumes and these staple crops in rotation. This acre had already been fertilized with acid phosphate and planted to early corn when it was decided to thus use it. It was then flat broken, two tons of lime applied, laid off into rows 3.75 feet wide, these fertilized in drill with acid phosphate at rate of 300 pounds per acre, bedded, and planted April 24 to Trice cotton. We were then requested to conduct this work with nitrogen carriers, particularly nitrate of ammonia which was to be furnished us from the government plant at Muscle Shoals, but which would necessarily reach us too late to apply under cotton before planting with any hope of making yields under boll weevil conditions. So it was decided to take this acre, divide it into one-twentieth acre plats and apply the different nitrogen carriers as early as the ammonium nitrate was received.

On May 22 scooter furrows were run on one side of each cotton row and these nitrogen carriers applied by hand in these furrows and covered with cultivator as cotton was worked. The plats were each 15 feet wide by 146 feet long and divided into four rows 3.75 feet wide. In weighing the cotton produced, the two inside rows were weighed and the results multiplied by forty in reducing to an acre basis.

Weevils made their appearance in this cotton before any squares were formed and were caught a few times by school children before squares began to form and beginning June 24 six applications of calcium arsenate were applied at weekly intervals with a hand machine. The first three applications remained on the cotton long enough to have its effect before being washed off by rain, but after this it rained each time within 24 hours after applying the poison and in our opinion its usefulness was largely destroyed. This acre of land, while the only one available for the work that was at all suitable, lacked uniformity and by no means the entire difference in yields as reported below can be attributed to the difference in fertilizers. In fact, high nitrogen with wet seasons and extreme boll weevil infestation appears to do more harm than good by inducing too much vegetative growth at the expense of fruiting, at least by so shading the ground as to interfere with the opening of the cotton.

As nearly as possible check plats were placed beside each fertilizer plat and in determining the increase in yield due to the fertilizer applied, the yield of the nearest check plat was subtracted from the plat in question. but in several instances this gave obviously erroneous results and in such instances we used the average yield of the nearest check plats.

The following table gives the result of this work in detail:

TABLE No. 1.—RESULTS FROM AVAILABLE NITROGEN UNDER COTTON

Number of Plat	FERTILIZER CALCULATED IN POUNDS PER ACRE	Yield of seed cotton calculated in lbs. per acre	Increase over check
1	100 Ammonium nitrate	1560	520
2	Check	1040	0
3	200 Ammonium nitrate	1120	80
4	300 Ammonium nitrate	1240	240
5	Check	1000	0
6	100 Ammonium nitrate—100 Ammonium sulphate	1160	160
7	400 Nitrate of Soda	1320	720
8	Check	600	0
9	200 Nitrate of soda	1000	400
10	400 Calcium cynamid	680	120
11	Check	560	0
12	200 Calcium cynamid	2000	1094
13	400 Cottonseed meal	1760	640
14	200 Cottonseed meal	1440	320
15	Check	1120	0
16	400 Sulphate of ammonium	920	800
17	200 Sulphate of ammonium	1040	200

TESTS WITH FERTILIZERS UNDER CORN, 1920.

On account or the fact that we were anxious to test out the fertilizing qualities of Florida Soft Phosphate and Ammonium Nitrate in comparison with other carriers of phosphorus and nitrogen and that we were very late in getting these materials due to circumstances over which we had no control, we were forced when they did come to use them under corn rather than cotton and to plant this corn much later than should have been done. Ordinarily this late planting of corn, May 25, would have been alright, but this year worms were unusually bad and attacked this late corn in great numbers so that we had to poison against them and corn was materially injured. The land used while fairly level and apparently uniform in quality evidently varied greatly in productive capacity so that we have no great confidence that the results as given represent the actual value of the fertilizers used. In order to get results that are really valuable, we believe such tests should extend over several years and our intention is to use these same plats repeatedly, using the same fertilizers, with the hope of finally getting results that are at least not contradictory.

To do this work twenty four plats of one-fourteenth acre each were selected in a reasonably level portion of the field where permanent work could be done. This land had been planted to sorghum in 1919 and these followed by oats in the fall, the last having been grazed by cattle and hogs during the winter and early spring. It was broken several times up to the time of

planting and was in a fine mechanical condition except for the lack of humus. The plats were 20 by 154 feet and were laid off into five rows four feet apart in which the fertilizers were applied May 25, mixed with the soil, and Paymaster corn immediately planted. The three inside rows of each plat were gathered late in the fall after the corn was well cured and the weights from each plat multiplied by 24 to reduce to acre basis and divided by 70 to reduce pounds to bushels.

The following table gives this work in detail:

TABLE No. 2.—FERTILIZERS UNDER CORN

No. of Plat	FERTILIZER CALCULATED IN POUNDS PER ACRE	Corn calculated in Bushels per acre	Increase over ch'k. in Bushels per acre	No. check plat used in comparison
1	280 Acid phosphate 280 Cottonseed meal 140 Kainit	18.5	4.5	14
2	280 Acid phosphate 140 Nitrate of soda 140 Kainit	19.9	5.9	14
3	Check	22.9	0	3
4	280 Acid phosphate 70 Ammonium nitrate 140 Kainit	24.3	1.4	3
5	280 Acid phosphate 140 Calcium cynamid 140 Kainit	24.0	1.1	3
6	280 Acid phosphate 280 Cottonseed meal	28.1	5.2	3
7	280 Acid phosphate 140Calcium cynamid	17.1	3.1	14
8	140 Ammonium sulphate	13.7	.3	14
9	280 Acid phosphate 140 Nitrate of soda	15.7	1.7	14
10	Check	18.5	0	10
11	280 Acid phosphate 140 Ammonium sulphate	23.3	4.8	10
12	280 Acid phosphate 70 Ammonium nitrate	26.7	8.2	10
13	280 Acid phosphate 140 Ammonium nitrate	15.4	1.4	14
14	Check	14.0	0	14
15	280 Acid phosphate 140 Ammonium sulphate 140 Kainit	14.4	.4	14
16	140 Calcium cynamid	14.4	.4	14
17	70 Ammonium nitrate	19.5	1.0	10
18	280 Cottonseed meal	21.2	2.7	10
19	280 Acid phosphate	15.4	1.4	14
20	280 Raw phosphate rock	12.7	1.3	14
21	Check	14.0	0	21
22	280 Basic slag	17.1	3.1	21
23	280 Florida soft phosphate	16.1	2.1	21
24	140 Nitrate of soda	17.1	3.1	21

SPACING TESTS WITH COTTON.

In 1920 at the suggestion of Dr. H. B. Brown of the main station it was decided to conduct at all the stations experimental work with the spacing of cotton, so early in the year twelve plats of one-eighth acre each were set aside for the work. These were divided into six rows 3½ feet wide to each plat and these fertilized with acid phosphate alone at the rate of 400 pounds per acre and the rows bedded. On April 24th Trice cotton seed from Holly Springs were planted on these rows and came up to a perfect stand. This cotton was cultivated several times before thinning so as to be sure that after thinning the stand would not be impaired by dying later. About May 20th this cotton was all thinned a hoe's width apart and on June 1st a careful hand went over the several plats leaving them thinned to three different thicknesses in the drills, first, hoe's width or six inches, second, one foot, and third, two feet. This was repeated four times giving a total of twelve plats or 72 rows. Actual counts of stalks when cotton was gathered showed the spacing averaged 10 inches apart in the thickest spacing, 15 inches in the next and 24 inches in the thinnest.

Nitrate of soda was applied as a top dressing to these plats on May 31 at the rate 150 pounds per acre and immediately worked into the soil with cultivator. Weevils in great quantities made their appearance very early in the season, long before squares appeared and many of these were caught by children. On June 22nd we began poisoning this cotton with arsenate of calcium applied with hand machine and these applications were repeated as follows: June 22, June 28, July 2, July 28 and August 3. The three first applications were effective as the weather was dry, but the last two were quickly followed by rains and apparently did little or no good. This cotton was all open by the middle of September and gave yields as follows from the several spacings:

TABLE No. 3.—RESULTS OF COTTON SPACING

DISTANCE IN DRILL	Yield per acre 1st. series	Yield per acre 2nd. series	Yield per acre 3rd. series	Yield per acre 4th. series	Average Yield per acre
10 inches	1504	1344	1072	944	1216
15 inches	1360	1192	928	952	1108
24 inches	1426	888	816	912	1010

TESTS WITH VARIETIES OF CORN, 1919 AND 1920.

Tests were conducted with varieties of corn at Poplarville during the years 1918, '19 and '20 but in 1918 the only land available for this work was of such variable composition due to erosion, the yields so low and the results generally so unsatisfactory that we will not publish them. In 1919 and 1920 the land chosen for this variety work was much more uniform, we were able to plant the corn much earlier and the yields were more nearly in line with what we might expect on average soils and under average conditions. In 1919 and 1920 the same land was used for this work with corn, this was a fairly level field which had grown corn and cowpeas in 1918, the corn making less than ten bushels per acre and the peas doing correspond-

ingly poorly. The corn stalks and peavines were grazed off by cattle during the following winter and the land flat broken in the early spring. Just before the land was planted to corn in 1919, it was disced, laid off into rows three and one-half feet apart and these fertilized April 1st with a mixture of two parts acid phosphate to one of cottonseed meal at the rate of 400 pounds per acre and this mixed thoroughly with the soil by running a scooter plow thru the furrow behind the distributor. An extremely hard rain followed the application of the fertilizer and before planting the corn on April 26 these furrows were freshened by again running a plow thru them and eighteen varieties of corn planted, a single row to each variety and these repeated four times. These rows were each one-fiftieth of an acre and in gathering the four rows pulled together, weighed, and the results multiplied by 12.5 to reduce to acre basis. This corn was all gathered September 28 and only records of weights were taken in pounds of slip-shucked ears per acre which were reduced to bushels by dividing by 72. The yields per acre in bushels were as follows:

Ferguson's Yellow Dent, 19.4; North Carolina Tucker-Mosby, 21.0; Wanamaker-Marlboro, 19.2; Paymaster, 25.0; Simmons Prolific, 23.0; Sure Cropper, 20.6; Rhodes-Mosby, 19.4; Hastings, 19.6; Allen's Cockes Prolific, 21.3; Woodruffs Mosby, 19.4; Jones-Vardaman, 19.4; Tennessee Red Cob (Mississippi Experiment Station), 18.7; Station Vardaman, 17.0; Station Paymaster, 21.3; 633-67, 16.8; Station Alabama Yellow, 18.5; Johnson's Prolific, 16.6; Selected Local Variety from J. J. Smith, Picayune, Miss., 20.8.

Cowpeas had been planted in all the above varieties at the last cultivation and stalks and peavines had been grazed off by cattle the following winter. The land was flat broken in the early spring, again laid off into rows three and one-half feet apart, and fertilized April 10th with acid phosphate alone at the rate of 400 pounds per acre applied in the drill and thoroughly mixed with the soil. This year sufficient land was added to the field to give five rows to each variety and on April 17th eighteen varieties were planted, each to a row and this repeated five times. These varieties all came up to a perfect stand, were thinned twice and the stalks finally left three feet apart in drill. On May 31st all were fertilized with nitrate of soda at the rate of 125 pounds per acre and this worked into the soil with cultivators.

This corn was cultivated thoroughly thruout the season, observations were made on June 26 and the degree of advancement of each variety noted. Peas were planted at the last cultivation and on October 4 the five rows of each variety were gathered and piled together. The eighteen piled were then shucked and divided into three piles, the first sound and marketable, the second partly decayed but suitable for hog feed, and the third worthless. The separate divisions to all varieties were then weighed and at same time seventy pound samples of each variety were taken to be shelled and percentage of grain and cob determined.

The table below gives the result of this work in detail; reduced in each instance to acre basis:

TABLE No. 4.—CORN VARIETY TEST, 1920.

Number of plat	NAME OF VARIETY	First grade	Second grade	Third grade	Percent grain	Total yield bushels per acre.	RELATIVE DEVELOPMENT, JUNE 26
1	Simmons Prolific	1130	170	5	85.5	19.9	Full tassel, few silks.
2	Jones Prolific	1070	220	20	85.3	20.0	Full tassel, few silks.
3	Cockes Prolific	920	200	30	85.5	17.5	Full tassel, few silks.
4	Garric	1020	130	10	82.8	17.1	Few tassels, no silks.
5	Hastings Prolific	1030	120	00	87.6	18.0	Number tassels, no silks
6	North Car. Prolific	1010	130	00	89.4	18.2	Full tassel, few silks.
7	Vardaman	960	120	00	88.7	17.1	Full tassel, few silks.
8	Station Mosby	1100	50	00	87.0	17.9	Few tassels, no silks.
9	Mosby 553	1200	70	5	88.6	20.2	Few tassels, no silks.
10	Woodruffs Mosby	1120	120	10	90.4	20.2	Few tassels, no silks.
11	Marlboro	1070	30	20	83.1	16.6	Very few tassels, no silks
12	Station Paymaster	1490	70	8	85.5	23.9	Full tassel, full silk.
13	Paymaster, Harpeth	1640	100	5	86.3	26.9	Full silk and tassel and further advanced than 12
14	Station Tenn., Red Cobb	1190	120	0	83.8	17.8	Nearly full tassel, no silk
15	Florida Flint	1460	70	0	85.0	23.2	Full tassel, some silk.
16	Johnson County White	1010	290	10	85.0	19.9	Full silk and tassel.
17	Hickory King	1100	160	10	88.5	20.4	Full silk and tassel.
18	Jones Vardaman	1320	90	00	87.6	22.1	Few tassels, no silks.

COTTON GROWING IN SOUTH MISSISSIPPI.

By E. B. FERRIS.

Introduction.—A great many inquiries are received here and at the main station for information in regard to growing cotton in South Mississippi and it has been deemed wise to issue a circular giving such information in concise form with which to answer these inquiries.

Our station is located in Pearl River County, about fifty miles in an air line from the Gulf Coast and while located at McNeill was approximately fifteen miles nearer this great body of water. I think the records of the Weather Bureau will show that locations so near the Coast have a considerably higher rainfall than those farther off and that possibly this excess of rainfall comes more largely in June, July and August, a time when cotton is fruiting best and when frequent showers will cause a lot of shedding, not considering the influence of such showers on the control of the boll weevil. We grew cotton at McNeill for a number of years before the boll weevil appeared and found an average of at least one year out of three entirely too wet for growing cotton satisfactorily. With the weevil cotton growing became so uncertain that for a number of years not a gin was operated in the county and this year, following several years of high priced cotton, only one gin was operated in the county and not one closer than fifteen miles from Poplarville. As a matter of fact Pearl River County and other counties so near the Coast have done little farming of any kind, being largely composed of forests or uncleared lands left after the timber is removed. Results obtained from growing cotton at McNeill and Poplarville could not, therefore, be applied to the greater part of South Mississippi without taking the facts as stated above into consideration.

To show what a great part the seasons here have in the production of cotton one has only to compare yields of varieties of cotton obtained at Poplarville in 1918, a dry year, and in 1919, a wet year. The conditions under which these two crops were made, so far as we were able to make them, were exactly the same, yet in 1918 made approximately a bale to the acre while few in 1919 made so much as 100 pounds of seed cotton to the acre. In neither year was anything done to control the boll weevil except to cultivate often and keep the cotton always in good growing condition. While the rains were not so heavy in 1920 as they were in 1919, they came, as nearly as we could tell, fully as often while the weevils made their appearance earlier in 1920 than they did in 1919, yet cotton yields here in 1920 compare favorably with those of 1918. We can account for this only from the fact that we tried to catch the first weevils and later used calcium arsenate to poison them. While at McNeill, we caught the first weevils and picked up the squares in an effort to grow cotton and found that if the seasons were wet the yields were poor, so we are forced to believe that the poisoning of the weevils this year had much to do with good yields in a wet year. Granting, however, that the poison was responsible for the increased yield over other wet years, it is an expensive operation of doubtful value except on the best lands and used under careful supervision.

Varieties.—A study of the following tables ought to give some idea of the varieties best suited to this section. This will vary with the seasons, but we believe under average conditions a variety that matures quickly will more nearly meet the average requirement of the country, but such a variety will frequently be one that in a dry season when boll weevil infestation is slight falls far behind others that continue to grow and fruit thruout the growing season. As best we can tell from observation here extending over a number of years, Trice cotton comes nearest of the varieties tried to doing its fruiting early in the season when it stops its growth, largely sheds its leaves and allows this fruit to open. Thus in 1918, a dry year, many varieties outyielded Trice here, but in 1920, a very wet year but more nearly alike our average season, it led all others though was followed closely by a strain of Cleveland.

TABLE No. 5.—COTTON VARIETY TEST, SOUTH MISSISSIPPI STATION, 1920.

NAME OF VARIETY	Yield seed cot. per plat	Percent stand May 1	Yield Seed cot. per acre	Lint per cent.	Lbs. lint per acre	Length of lint	Val. lint per lb. in cts.	Val. lint per acre	Val. seed per acre	Total money value	Rank in money val.
Simpkins	62	90	1240	33.8	419.1	7/8	16	$67.06	$10.26	$77.32	9
Trice-270-41	64	25	1280	30.9	395.5	1 1/8	19	75.15	11.06	86.21	3
Wannamaker-Cleveland	48	50	960	34.9	335.	7/8	16	53.60	7.81	61.41	13
Cleveland Big Boll	53	53	1060	34.0	360.4	1	16¼	58.57	8.75	67.50	11
Cleveland-37W-54	64	90	1280	33.4	427.5	1 1/16	17	72.68	10.66	83.34	5
Cleveland (Smiths)	66	95	1320	33.	435.6	7/8	16	69.70	11.06	80.76	7
Trice-270-41 (Holly Spgs.)	74	80	1480	32.	473.6	1	16¼	76.96	12.58	89.54	2
Cook-1010	50	90	1000	35.9	359.	7/8	16	57.44	8.01	65.45	12
Mexican Big Boll	55	60	1100	31.7	348.7	1 1/16	17	59.28	9.39	68.67	10
Miller	42	25	840	31.7	266.3	1 1/8	19	50.60	7.17	57.77	14
Acala	32	30	640	35.2	225.3	1 1/16	17	38.30	5.18	43.48	17
Express-432	46	60	920	33.1	304.5	1 3/16	23	70.04	7.69	77.73	8
Express-122-433	53	75	1060	28.0	296.8	1 1/4	27	80.14	9.54	89.68	1
Foster-120-6102	53	20	1060	21.1	329.7	1 3/16	23	75.83	9.13	84.96	4
Webber-49-3	38	75	760	30.4	231.	1 5/16	32½	75.08	6.61	81.69	6
Hartsville	28	50	560	30.0	168.	1 1/4	27	45.36	4.90	50.26	15
Lone Star-132-38	34	20	680	29.0	197.2	1 1/8	19	37.47	6.04	43.57	16

Fertilizers.—It is a difficult matter to decide the best and cheapest fertilizer for cotton. A study of the tables that follow will show very contradictory results although the work as reported was as carefully done as we knew how to do it. At McNeill the addition of potash to a mixture containing nitrogen and phosphorus gave on an average little more or no gain in the yield of cotton, though potash alone usually gave slightly increased yields over no fertilizer. At Poplarville for the short time the work has been going on potash has seemed more essential. Thus in 1920 the average increase in yield of seed cotton from the addition of phosphorus alone was 324 pounds, from Nitrogen alone, 297 pounds and from potash alone, 207 pounds, but strange to say that only in two instances did any combination of the three give any greater if as great yields as did the phosphorus alone. A study of all the work done with fertilizers at McNeill and Poplarville leads us to the conclusion that phosphorus is the most essential element in a fertilizer for these soils, that acid phosphate is the best source from which to supply it and that moderate applications of this acid phosphate with rather small amounts of nitrogen will give best results. In most instances we believe as good yields of cotton may be had 300 pounds of acid phosphate and 100 pounds of cottonseed meal applied in the drill before planting as from any other combination of fertilizers we may use and that it matters little from what source the nitrogen furnished by the cottonseed meal comes. Some of our best results have been obtained from the use of acid phosphate alone before planting followed by top dressings of nitrate of soda when the cotton is up. At the same cost per unit of nitrogen we prefer cottonseed meal as its source because it makes a better mechanical mixture with acid phosphate, comes more gradually available to plants, but the time ought never to come when this meal would sell low enough to meet the competition with other nitrogen carriers although just at this time it is as cheap a source of nitrogen as is nitrate of soda.

TABLE No. 6.—FERTILIZER WORK WITH COTTON, 1920.

Number of plat.	FERTILIZERS CALCULATED IN LBS. PER ACRE	Yield of seed cotton calculated Lbs. per A. Series 1.	Increase over check.	Yield of seed cotton calculated Lbs. per A. Series 2.	Increase over check.	Average increase over check plats.
1	240 Acid phosphate	1152	306	1080	342	324
2	Check	594		594		
3	60 Calcium Cyanamid	900	306	882	288	297
4	100 Nitrate of Soda	954	126	774	198	162
5	Check	828		576		
6	240 Acid Phosphate 60 Calcium Cyanamid	954	126	792	216	171
7	60 Calcium Cyanamid 200 Kainit	1080	252	900	288	270
8	Check	828		612		
9	240 Acid Phosphate 200 Kainit	1008	180	900	288	234
10	240 Acid Phosphate 60 Calcium Cyanamid 200 Kainit	1096	160	1008	306	233
11	Check	936		702		
12	240 Acid Phosphate 100 Nitrate of Soda 200 Kainit	972	36	1152	450	243
13	240 Basic Slag	882	90	756	90	90
14	Check	792		828		
15	Check	846		738		
16	240 Raw phosphate Rock	612	18	774	36	27
17	200 Kainit	1026	324	900	90	207
18	Check	702		810		
19	240 Basic Slag 60 Calcium Cyanamid 200 Kainit	1008	306	990	80	193
20	240 Raw Phosphate Rock 60 Calcium Cyanamid 200 Kainit	1062	126	918	216	171
21	Check	936		702		
22	240 Acid Phosphate 200 Kainit 50 Nitrate Soda Apr. 10 50 Nitrate Soda Jun. 1	936		990	188	94
23	240 Acid Phosphate 200 Kainit 50 Nitrate Soda Jun. 1 50 Nitrate Soda Jul. 1	1224	270	612	18	144
24	Check	954		594		
25	480 Acid Phosphate 100 Nitrate of Soda 200 Kainit	1278	324	918	324	324
26	240 Acid Phosphate 200 Nitrate of Soda 100 Kainit	1458	504	972	306	405
27	Check	954		666		
28	240 Acid Phosphat 100 Nitrate of Soda 400 Kainit	1296	324	1026	360	351

TABLE No. 7.—FERTILIZER TESTS WITH COTTON AND CORN, 1919

Plat Number	FERTILIZER CALCULATED IN LBS PER ACRE.	Yieldof seed cot. 1919 calculated in lbs per acre.	Increase over check.	Yield of corn calculated in bushels per acre.	Increase over check.
1	240 Acid Phosphate	216	36	36.7	9.0
2	Check	90		22.7	
3	200Cottonseed Meal	180	90	36.0	13.3
4	100 Nitrate of Soda	135	13	29.2	1.5
5	Check	148		27.7	
6	240 Acid Phosphate 200 Cottonseed Meal	162	14	29.2	1.5
7	200 Cottonseed Meal 100 Neb. Potash	144	36	27.0	.8
8	Check	108		26.2	
9	240 Acid Phosphate 100 Neb. Potash	216	108	24.5	—1.7
10	240 Acid Phosphate 200 Cottonseed Meal 100 Neb. Potash	185	36	24.7	—1.8
11	Check	149		26.5	
12	240 Acid Phosphate 100 Nitrate of Soda 100 Neb. Potash	216	67	27.0	.5
13	240 Basic Slag	149	5	20.0	.3
14	Check	144		19.7	
15	Check	180		27.7	
16	240 Raw Phosphate Rk.	90	90	20.5	—7.2
17	100 Neb. Potash	216	108	30.2	2.5
18	Check	108		27.7	
19	Basic Slag 200 Cottonseed Meal 100 Neb. Potash	180	72	29.5	1.8
20	240 Raw Phosphate Rk. 200 Cottonseed Meal 100 Neb. Potash	207	81	29.0	1.5
21	Check	126		27.5	
22	240 Acid Phosphate 100 Neb. Potash 50 Nitrate Soda, Apr. 1 50 Nitrate Soda, Jne. 1	216	90	31.7	4.2
23	240 Acid Phosphate 100 Neb. Potash 50 Nitrate Soda, Jne. 1 50 Nitrate Soda, Jul. 1	257	131	37.2	17.0
24	Check	126		20.2	
25	480 Acid Phosphate 100 Nitrate of Soda 100 Neb. Potash	207	81	22.7	2.5
26	240 Acid Phosphate 200 Nitrate of Soda 100 Neb. Potash	293	140	31.7	12.2
27	Check	153		19.5	
28	240 Acid Phosphate 100 Nitrate of Soda 200 Neb. Potash	239	86	24.5	5.0

From all results obtained at McNeill and Poplarville we would conclude that under average conditions raw phosphate or soft phosphate rock neither have any great availability and that regardless of their cheapness it does not pay to use them; that basic slag has considerably more availability than the other two but is still far behind acid phosphate in this respect and as the prices of the two are not widely different we see no incentive to use the less available kind.

Culture.—In speaking of South Mississippi we have reference to the Coastal Plains Region thereof and not to other soil types that compose a part of this territory. As a rule these Coastal Plains soils are sandy-loams easily prepared and cultivated and from a physical standpoint among the most desirable soils in the state. As a rule they lack organic matter and particularly phosphorus and nitrogen. Every effort should be made to increase their natural supply of organic matter by growing crops in rotation with cotton and we have found none that accomplish this end more quickly than corn and velvet beans under a two-year three-crop system. A rotation of cotton, corn and cowpeas and oats followed by cowpeas under a three-year five-crop system also very effective as was conclusively shown by careful experiments carried on for a number of years at McNeill. We also tried at McNeill a method of growing cotton every year with vetch in the winter and early spring, but found this too expensive on account of the fact that the vetch did not reseed well and, too, occupied the ground so late in the spring that the cotton got a late start and would produce nothing under boll weevil conditions. We believe this reseeding of the vetch might be improved by liming the land, so have started at Poplarville an experiment of growing it with cotton and corn in rotation on land well limed. Under the same conditions we are also using bur clover with the hope that it may be even better than vetch.

Under a system of well conducted rotations, we believe acid phosphate alone applied in the drill before planting at the rate of from 200 to 400 pounds per acre, fallowed after the cotton is up and thinned by a top dressing of nitrate of soda at the rate of from 50 to 100 pounds per acre will give the cheapest yields of cotton so far as fertilizers are concerned. Rows placed three and one-half feet apart are very satisfactory and we prefer to put the acid phosphate in the drill and bed upon it some days in advance of planting so as to give a firm seed bed in which the seed will germinate quickly when planted. On the naturally well drained soils of the section these beds should be dragged down to where the top is only slightly elevated above the average of the field. A Ledbetter one-seed planter so set as to drop the seed as close together as possible will give a stand easily thinned and at same time require much fewer seed than the old fashioned planters. The consensus of opinion seems to be that close spacing in the drill gives larger yields than wider spacing, but a hoe's width apart is about as close as it can be cleaned satisfactorily. Experiments here this year on spacing were favorable to the close spacing, hoe's width, or nine inches, giving 1216 pounds per acre, fifteen inches 1108 pounds, and 24 inches 1010 of seed cotton per acre respectively.

SWEET POTATO GROWING IN SOUTH MISSISSIPPI.

Early in the year of 1919 at the suggestion of and in collaboration with the extension forces of the state several bushels each of Nancy Hall, Porto Rican and Triumph seed potatoes were treated with bichloride of mercury and bedded here. Slips from these potatoes were later used in a test to determine the relative yields of the several varieties as well as to conduct tests with fertilizers under a single one of these varieties. Mr. E. F. White, at that time Extension Horticulturist, obtained the seed potatoes for us from growers with whom he was acquainted and we have never had any reason to doubt the purity of the varieties. Early in May of 1919 the field in which the variety work was to be done was fertilized with a mixture of two parts acid phosphate and one part cottonseed meal applied in the drill at the rate of about 400 pounds per acre, the rows being three and one-half feet apart, all were cultivated alike and equal areas of each were dug and weighed at two different times, August 28 and Nov. 28 and yields calculated in bushels per acre, the potatoes at each time of digging being separated into two lots according to size which we designated marketable and unmarketable.

In 1919 we had an abundance of slips to do all work outlined, but in 1920 our first bedding of these same varieties were so injured by continuous wet and cold weather extending into the early spring that all the first bedding rotted and there were not enough of the varieties left to give as many slips as were required to carry on experiments with varieties and fertilizers, hence we were compelled to cut the vines from the earlier plantings of Nancy Hall potatoes and this apparently greatly reduced the yields of this variety in 1920. We noted in this work during both years that the Nancy Hall potatoes had a tendency to die in the rows after the slips or vines had been set and had begun to grow. This tendency was much more pronounced with this variety than with either of the other two and we plan to have the plant pathologist do some cooperative work here another year in an effort to determine the true cause of this trouble with the hope that it may be corrected.

The following tables give results of this work with sweet potatoes in detail:

TABLE No. 8.—SWEET POTATO VARIETY YIELDS
(Given in Bushels per Acre)

VARIETY	HARVESTED AT MATURITY								Harves'd for Early Market 1919 only (Aug. 28).		
	1919			1920			2 yr. av. of total yields	2 yr. av. of No. lbs.			
	Marketable	Unmarketable	Total	Marketable	Unmarketable	Total			Marketable	Unmarketable	Total
Porto Rican	92	33	125	161 1-3	34 2-3	196	160 1-2	126 2-3	13	11	24
Nancy Hall	63	34	97	54 2-3	36	90 2-3	93 5-6	58 5-6	33	21	54
Triumph	117	40	157	157 1-3	53 1-3	210 2-3	183 5-6	137 1-6	31	23	54

TABLE No. 9.—SUMMARY OF RESULTS ON SWEET POTATO FERTILIZER EXPERIMENTS TWO SEASONS, 1919 and 1920

No. of Plat	Lbs. of Fertilizer applied per acre	Yield 1919 Bushels per acre	Increase Over check Plat 1919 (Bushels)	Yield 1920 Bushels per acre	Increase over check Plat 1920 (Bushels)	Average increase over check plat 1919-1920) (Bushels)
1	A. P.—400 C. S. M.—200 Nitrate Soda—100 Potash—0	148	54.2	97.32	32.68	43.44
2	Check Plot	93.8		70.8		
3	A. P.—400 C. S. M.—200 Nitrate Soda—100 *Neb. Potash—100	101.5	7.7	70.8	6.16	6.93
4	A. P.—400 C. S. M.—200 Nitrate Soda—100 Neb. Potash—200	244	37.9	185.87	51.02	44.46
5	Check	206		134.85		
6	A. P.—400 C. S. M.—200 Nitrate Soda—100 Neb. Potash—300	202.6	—3.5	186.66	51.81	24.16
7	A. P.—400 C. S. M.—200 Nitrate Soda—100 Neb. Potash—200	235	74.4	190.11	50.78	62.59
8	Check	160.6		139.33		
9	A. P.—0 C. S. M.—200 Nitrate Soda—100 Neb. Potash—200	164.1	3.5	155.14	15.81	9.66
10	A. P.—400 C. S. M.—0 Nitrate Soda—0 Neb. Potash—200	165	64	140.53	63.53	63.73
11	Check	101		77.		
12	A. P.—400 C. S. M.—400 Nitrate Soda—200 Neb. Potash—200	152.4	51.4	153.52	76.52	63.96

*Note—In 1920 an equivalent amount of potash was supplied by Kainit.

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Experiments in
DUSTING AND SPRAYING PEACHES
For the Control of Curculio, Brown Rot, and Scab

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U. S. Dept. of Agriculture, in charge, and
Leslie Pierce, Bureau of Plant Industry,
U. S. Department of Agriculture, in cooperation with the Mississippi State Plant Board and Holly Springs Branch of the Mississippi Agricultural Experiment Station

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EXPERIMENTS IN DUSTING AND SPRAYING PEACHES FOR THE CONTROL OF CURCULIO, BROWN ROT, AND SCAB*.

By Oliver I. Snapp, U. S. Bureau of Entomology, in charge,
and Leslie Pierce, U. S. Bureau of Plant Industry.

INTRODUCTION.

Curculio, brown rot, and scab are responsible for the greatest part of the yearly damage to the peach crop in the South. During the past two seasons climatic conditions in Mississippi have been quite favorable for the germination of brown rot spores, and this disease alone has caused considerable losses in unsprayed orchards, while the curculio or common peach "worm" yearly causes thousands of dollars worth of damage to the Mississippi peach crop. During the past season fifty to sixty per cent of the peaches produced in unsprayed Mississippi orchards were "wormy."

Many advantages of the dry spraying or dusting over the liquid spraying for the control of the principal pests of peaches have been put forth by those who advocate the dusting method. The aim of this publication is to give a report of the results obtained in Mississippi during the 1920 season in testing the efficiency of various dust schedules as compared with the liquid schedule which has been used on peaches in the South for years.

OBJECTS.

The chief objects of these investigations were to study the following points in the control of curculio, brown rot, and scab:—(1) Actual count of fruit from certain trees in each plat to determine the percentage of perfect fruit and fruit damaged by curculio, brown rot and scab. Each peach from these count trees was cut open so that the curculio damage could be accurately ascertained. (2) The total yield of fruit from plats receiving various dust treatments as compared with the liquid treatment. (3) Comparative cost per tree of the various treatments.

LOCATION AND DESCRIPTION OF ORCHARD.

The experiments were conducted in the W. G. Bias orchard, located five miles south of New Albany, Union County, Mississippi. The orchard consisted of some sixty-nine acres of nine year old Belle of Georgia and Carmen peach trees. The orchard has been sprayed from year to year, yet it has suffered in previous years from the pests heretofore mentioned. Excellent hibernating quarters for adult curculios were quite numerous near the orchard, and many brown rot mummies of the previous season were found before the experiment was started. Most of the trees had made fair growth, although the new growth of the several past seasons was quite short on account of the lack of cultivation and fertilization. The soil was a sandy loam of the Orangeburg series.

*These experiments were conducted under the direction of Dr. A. L. Quaintance and Dr. J. W. Roberts of the U. S. Dept. of Agriculture, in cooperation with the Mississippi State Plant Board and Holly Springs branch of the Mississippi Agricultural Experiment Station.

Seven hundred and sixteen trees were utilized in the experiment and they were divided into seven plats of as near equal size as practical so that the various schedules would have an equal chance to prove their effectiveness. A much more extensive experiment was planned; however, the cyclone which swept this section on the morning of April 20th completely destroyed the trees in Plats 1, 2, 3, 11, 12, 13, 14, and 15 so that the schedules which were to be used on these plats had to be cut out entirely. The plats contained the following number of trees:

Plat 4— 97 trees
Plat 5—101 trees
Plat 6—109 trees
Plat 7—104 trees
Plat 8—101 trees
Plat 9—104 trees
Plat 10—100 trees

In the center of each plat ten trees were selected and tagged as count trees from which each peach was cut, examined, and an actual count made during harvest in order to ascertain the exact percentage of fruit injured by curculio, brown rot, and scab.

APPARATUS AND PREPARATION OF MATERIALS.

All of the dust applications were made with a large model D1 Niagara duster driven by a 3½ H. P. engine. The liquid sprays were applied with a barrel hand outfit developing about 175 pounds pressure per square inch.

One of the chief points to consider in dusting is fineness of materials, properly and thoroughly mixed. The only way that this can be accomplished is with a mechanical sifter and mixer built especially for the purpose. Superfine sulphur guaranteed 95% to pass a 200 mesh sieve and an exceedingly light diplumbic arsenate of lead was used in all dust mixtures. Fineness of material seems to have a great deal to do with the ability of the mixture to stick. The fine hairs which cover the fruit serve as lodging places for the finest particles and they are here somewhat protected from climatic conditions which would otherwise tend to wash or blow them off.

In preparing the self-boiled lime-sulphur for the liquid applications special attention was given to fineness of sulphur and to see that it was thoroughly wet before adding to the lime. This is one of the most important points to keep in mind when preparing this material. If any small lumps of sulphur are left when it is added to the boiling lime it will usually not break; therefore it will remain in the container throughout cooking operations without combining. The best grade unslacked lime should be used, care being exercised not to drown it with too much water before cooking starts. If the sulphur has been made thoroughly wet before adding there is no necessity of adding more water to the lime than enough to cover the lumps.

METHODS OF RECORDING RESULTS.

As before stated there were ten count or record trees in the center of each plat. The fruit from each of these trees was harvested separately, cut open, and an actual count made of the perfect fruit and that injured by curculio,

brown rot, and scab. The fruit from the remainder of the plat was then harvested separately, graded and packed by experienced packers, and a record made of the production per plat in terms of six basket crates of number ones and culls, these being the only grades used at this orchard.

The following outline gives the schedules used on the various plats:

Plat No.	1st Application	2nd Application	3rd Application
4	Dust-Arsenate lead powd. 10%; lime 10%; sulphur 80%.	Arsenate-lead powd. 10%; lime 10%; sulphur 80%.	Arsenate-lead powd. 10%; lime 10%; sulphur 80%.
5	Dust-Arsenate lead powd. 10%; lime 90%.	Arsenate-lead powd. 10%; lime 10%; sulphur 80%.	Sulphur 80% Lime 20%
6	Dust-Arsenate lead powd. 5%; lime 95%.	Arsenate lead powd. 5%; lime 15%; Sulphur 80%.	Sulphur 80% Lime 20%
7	Dust-Lime 70%; sulphur 30%.	Lime 70%; sulphur 30%	Lime 70%; sulphur 30%
8	Check-Untreated		
9	Spray—Arsenate lead powd. 1 lb.; water 50 gal.; stone lime 3 lbs.	Self-boiled lime-sulphur 8-8-50; arsenate lead powd. 1 lb.	Self-boiled lime-sulphur 8-8-50.
10	Dust-Arsenate lead powd. 15%; lime 85%.	Arsenate-lead powd. 15%; sulphur 50%; lime 35%.	Sulphur 50% Lime 50%

The first application was made on April 22nd as the shucks were being forced off of the little peaches. This application was delayed about three days on account of the cyclone damage which occurred on April 20th. The second applications were applied on May 11th and the third and last on June 12th about four and one half weeks before the fruit was harvested.

RESULTS.

The following summary of results brings together in terms of percentage the data obtained in making counts of the fruit from the record trees and the total commercial production from the plats. The two columns on the right are commercial results of fruit harvested from each plat except that taken from the count or record trees.

TABLE 1. SUMMARY OF RESULTS

Plat No.	Total No. Fruit	PER CENT TOTAL FRUIT										Per cent Brown Rot infection at curculio puncture	Per cent Sound Fruit	PER CENT TOTAL FRUIT (Commercial results measured in terms of 6 basket peach crates	
								Curculio wormy							
		Curculio wormy	Brown rot	Scab	Curculio wormy only	Brown Rot only	Scab only	Brown Rot Scab	Brown Rot	Scab	Brown Rot Scab			No. 1 Fruit	Cull Fruit
4	3057	19.83	.78	.36	19.50	.55	.26	0	.13	.10	0	.10	79.36	74.87	25.13
5	2831	31.29	1.59	.99	29.74	.85	.18	0	.25	.81	0	.49	67.68	84.01	15.99
6	2575	34.25	1.86	.94	32.81	.81	.47	0	.27	.43	.04	.74	64.43	84.69	15.31
7	2417	45.80	8.60	9.55	37.24	4.18	3.43	.58	1.03	4.84	.70	2.11	45.89	72.28	27.72
8	3104	47.48	8.96	40.4	23.74	2.62	17.27	2.77	1.16	18.88	1.48	.93	31.15	64.21	35.79
9	3000	29.03	2.10	.40	27.93	1.30	.07	.03	.24	.30	0	.53	69.60	88.08	11.92
10	2924	31.94	3.14	.14	30.51	1.85	0	0	.44	.14	0	.85	66.21	79.49	20.51

Quite severe foliage injury occurred on Plat 4 where 10% arsenate of lead dust was used in all three applications. Some of the trees in this plat were 80% defoliated by harvest time. The last application about four and one half weeks before the fruit ripened seemed to be largely responsible for most of the defoliation. The fruit on this plat matured unevenly and much of it was hard, lacked sugar and was insipid. These trees, however, were on thin soil which had received no fertilizer and very little cultivation for several years. The trees themselves were not vigorous and healthy as those on some other plats. It was quite evident that three applications of arsenate of lead were too many for trees in this orchard. Quite pronounced foliage injury was also noted on plat 10 where 15% arsenate of lead was used in the dust mixture. Some of the trees in this plat were entirely defoliated two months earlier than normal. Fifteen percent arsenate of lead cannot be used safely on peach foliage.

By referring to the above table it will be found that Plat 4 shows the lowest percentage of curculio wormy fruit 19.83%. Plat 9, the liquid sprayed plat, came next with 29.03% curculio wormy fruit. The low percentage of curculio wormy fruit on plat 4 as compared with the other plats is without doubt due to the three applications of arsenate of lead; however, as noted before, trees on thin soil will not stand three arsenical applications on account of foilage injury which will affect the ripening and size of the fruit.

The percentage of cull fruit in the commercial results ran high in plats 4 and 10 on account of the heavy defoliation before harvest which caused a quantity of the fruit to be small and grade culls which were not affected by a disease or worm.

Five percent arsenate of lead dust in the first two applications gave almost as efficient curculio control as 10% or 15%. The 5% yielded 34.25 percent curculio wormy fruit, while the 10% had 31.29%, and the 15% 31.94 per cent. As noted before, 15% arsenate of lead is too much for peach foliage on account

of severe burning. Apparently, therefore, no great advantage is obtained by increasing the amount of arsenate of lead in a dust mixture above 5 or 8%.

Plat 7 evidently did not contain enough sulphur to properly control brown rot and scab. Plat 7 received 30% sulphur in all three applications. This plat gave 8.6% brown rot while the check plat yielded 8.9% of the fruit damaged by brown rot at harvest. This plat also gave 9.5% scabby fruit while the scab percentage was negligible on all other plats except the check. 30% sulphur, however, reduced the scab infection as the check gave 40.4%. On account of the lack of an arsenical in the dust schedule used on Plat 7 the total percentage of curculio wormy fruit was almost as high as the check, there being 45.8% wormy fruit on Plat 7 as compared with 47.4% wormy fruit on the check plat.

The quality of the fruit produced on Plat 9, the liquid sprayed plat, was possibly the best in the orchard. It ripened evenly, colored well, and the packers could easily tell the difference when fruit from this plat was placed on the tables. Furthermore, it gave a higher percentage of number one fruit in the commercial results than any other plat, and the lowest percentage of curculio wormy fruit with the exception of the past schedule in which three applications of arsenate of lead were used. Dust schedules 4, 5, 6, and 10, however, held up very well as compared with the liquid schedule in controlling brown rot and scab.

There was very little sound fruit on the check plat. The results show 31%; however, even this was of poor quality. By referring to the commercial results in the table it will be found that the check plat yielded 35.8% cull fruit. Plat 7 also gave 27.7% cull fruit but the schedule used on this plat contained no arsenate of lead and only 30% sulphur, not enough to properly take care of the diseases.

With the proper amount of sulphur the dust schedules will probably control the diseases a little better than the liquid, but the liquid apparently gives the best curculio control. The general quality of the fruit from the liquid sprayed plat was better than that from the dusted plats; however, the dust in some cases seemed to assist somewhat in coloring the fruit.

Some hydrated lime is needed in a dust schedule to make it fluid which facilitates the carrying of it to the trees. Ninety percent sulphur is too heavy and a quantity is usually lost by immediately falling to the ground from the exit pipe before it reaches the tree. Eighty percent apparently is the greatest amount that can be satisfactorily carried to the trees.

COMPARATIVE COST OF THE DUST AND LIQUID SPRAYS.

In calculating the cost per tree for the entire three applications only the time actually spent in making the applications was used as a basis for man, horse, and machine hour calculation. Time spent on account of engine trouble, to refill hopper or spray tank, etc., was not taken into consideration.

Horse hours were calculated at 20 cents per hour, man hours at 30 cents per hour and machine hours at 20 cents per hour. The arsenate of lead cost was used at 40 cents per pound, sulphur at 4½ cents per pound, and hydrated and stone lime at 1½ cents per pound.

The following is the total cost for the three applications on the various plats:

The dust schedule used on Plat 4 cost 8 cents per tree.
The dust schedule used on Plat 5 cost 5.3 cents per tree.
The dust schedule used on Plat 6 cost 4 cents per tree.
The dust schedule used on Plat 7 cost 2.4 cents per tree.
The liquid schedule used on Plat 9 cost 4.7 cents per tree.
The dust schedule used on Plat 10 cost 4.5 cents per tree.

The initial cost of the dust material was very much more than that used in the liquid schedule; however, on account of the rapidity with which the dust can be applied, this difference was offset when the total cost per tree for the three applications was calculated taking into consideration horse, man, and machine hours used in making the applications. One hundred trees could easily be dusted in fifteen minutes whereas with one lead of hose one hour was required to properly apply the liquid spray to the same number of trees. This rapidity of applying dust has another value in that it is possible to get over the orchard quickly at critical times when weather conditions have been favorable for brown rot, or scab, etc.

The cost of eight cents per tree for the three applications used on plat 4 was the result of arsenate of lead in all the applications. The low cost of the schedule used on Plat 7 was due to the absence of arsenate of lead in this schedule. There was very little difference between the cost of the liquid schedule used on Plat 9 and the dust schedules used on Plats 5, 6, and 10. From these calculations it is evident that after the cost of applying the materials is taken into consideration there is little difference between the total cost of dust and liquid spraying.

RECOMMENDATIONS.

As a result of these experiments the following conclusions may be made as to the schedules recommended for future use in the state:

The quite heavy percentage of curculio wormy fruit on all plats in the experiment in spite of the applications of arsenate of lead show that an additional application of arsenate of lead might be advisable on the heavier soils where the trees are quite healthy and are making vigorous growth. The lowest percentage of curculio wormy fruit on any plat in the experiment was 19.8%. This percentage ran as high as 34.2% on one plat receiving arsenate of lead in two applications. This damage from curculio could be reduced by applying an early application of arsenate of lead, about the time most of the petals have fallen, as our data shows that the beetles are appearing on peach trees in numbers about this time during a normal season.

In using the liquid spray the following four applications are recommended

for use on healthy trees on fertile soil. The first application should be omitted on the poorer soils and where trees are stunted or unhealthy.

First application:—Immediately after the blossoms have fallen use arsenate of lead powder, one pound to fifty gallons of water plus five pounds of unslacked lime. Slack lime in a small container of water before adding to the spray tank.

Second application:—Ten days later or when the small peaches are bursting through the shucks use the same spray as recommended for first application.

Third application:—About two weeks after second application use self-boiled lime-sulphur 8-8-50 plus one pound of arsenate of lead powder.

Fourth application:—About four weeks before the fruit is due to ripen use self-boiled lime-sulphur 8-8-50 alone.

In using dust, four applications would be advisable on healthy, vigorous trees on strong soil. The four application schedule recommended is as follows:

First application:—Immediately after blossoms fall dust with 5% arsenate of lead and 95% hydrated lime.

Second application:—Ten days later, using same dust mixture as for first application.

Third application:—Two weeks after second application use 5% arsenate of lead; 70% sulphur;and 25% hydrated lime.

Fourth application:—About four weeks before fruit ripens use 70% sulphur and 30% hydrated lime.

On the poorer soils where trees have not made good growth the three application dust schedule is recommended as follows:—

First application:—About ten days after blossoms fall or when calyces are shedding use 10% arsenate of lead and 90% hydrated lime.

Second application:—Two weeks later use 10% arsenate of lead; 70% sulphur; and 20% hydrated lime.

Third application:—About four weeks before the fruit is due to ripen use 70% sulphur and 30% hydrated lime.

MISSISSIPPI AGRICULTURAL EXPERIMENT STATION
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COTTON GROWING IN SOUTH MISSISSIPPI

By E. B. Ferris

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December, 1920.

COTTON GROWING IN SOUTH MISSISSIPPI

By E. B. Ferris

Introduction—A great many inquiries are received here and at the main station for information in regard to growing cotton in South Mississippi, and it has been deemed wise to issue a circular giving such information in concise form with which to answer these inquiries.

Our station at Poplarville is located in Pearl River County about fifty miles in an air line from the Gulf Coast and while located at McNeill was approximately fifteen miles nearer this great body of water. We think the records of Weather Bureau will show that locations in this State so near the Coast have a considerably higher rainfall than those farther off and that possibly this excess of rainfall comes more largely in June, July and August, a time when cotton is fruiting best and when frequent showers will cause a lot of shedding, not considering the influence of such showers on the control of the boll weevil. We grew cotton at McNeill for a number of years before the boll weevil appeared and found an average of at least one year out of three years entirely too wet for growing it satisfactorily. With the weevil, cotton growing became so uncertain that for a number of years not a gin was operated in the county and this year, following several years of high priced cotton, only one gin was operated in the county and not one closer than fifteen miles from Poplarville. As a matter of fact, Pearl River County and other counties so near the Coast have done little farming of any kind in the past, being largely composed of forests or uncleared lands left after the timber is removed. Results obtained from growing cotton at McNeill and Poplarville could not, therefore, be applied to the greater part of South Mississippi, without taking the facts as stated above into consideration.

To show what a great part the seasons here play in the production of cotton one has only to compare yields of varieties of cotton obtained at Poplarville in 1918, a dry year ,and in 1919, a wet year. The conditions under which these two crops were made, so far as we were able to make them, were exactly the same, yet in 1918 many varieties tested made approximately a bale to the acre while few in 1919 made so much as 100 pounds of seed cotton to the acre. In neither year was anything done to control the boll weevil except to cultivate often and keep the cotton as nearly as seasons would permit, always in good growing condition. While the rains were not so heavy in 1920 as they were in 1919, they came, as nearly as we could tell, fully as often while the weevils made their appearance earlier in 1920 than they did in 1919. Yet cotton yields here in 1920 compare favorably with those of 1918. We can account for this only from the fact that we tried to catch all the first weevils and later used calcium arsenate to poison them. While located at McNeill we tried catching the first weevils and picking up squares in an effort to grow cotton and found that if the seasons were wet the yields were poor, regardless of the extra effort, so we are forced to believe that the poisoning of weevils this year had much to do with good yields in a wet year. Granting, however, that the poison was responsible for the increased yield over other wet years, it is an expensive operation of doubtful value under present prices of cotton, except on the best lands and used under careful supervision.

Varieties—A study of the following tables ought to give some idea of the varieties best suited to this section. This will vary with the seasons, but we believe under average conditions a variety that matures quickly and largely sheds its foliage will more nearly meet the requirement of the country, but such a variety will frequently be one that in a dry season, when boll weevil infestation is slight, falls far behind others that continue to grow and fruit thruout the growing season. As best we can tell from observation here extending over a number of years, Trice cotton comes nearest of the varieties tried to doing its fruiting early in the season when boll weevil infestation is light, then stops its growth, largely sheds its leaves and allows this fruit to

open. Thus in 1918, a dry year, many varieties out-yielded Trice, but in 1920, a very wet year but more nearly like our average season, Trice led all others, being followed closely by a strain of Cleveland.

Summary of results with varieties of cotton at Poplarville, 1918-'19-'20:

Calculated in Pounds of Seed Cotton per Acre.

Name of Variety	1918	1919	1920
Simpkins	1120	100	1240
			1480
Trice 270-41 (Holly Springs)			1480
Trice	1200		
Trice 270-41 (College)	1220		1280
Dodd's Prolific	940		
Wannamaker Cleveland	1100	93	960
Cleveland Big Boll	1460	75	1060
Cook 1010	1500		1000
Sunbeam	900	31	
Rowden	1300		
Lone Star 15	1220	112	680
Triumph	1220	62	
Lone Star 132	1380	200	
Express 122-433	1780	125	1060
Express 350	1020	112	
Express 432	1240	75	920
Columbia	1100		
Webber 49	1040	78	760
Foster 120	1060	93	1060
Meade	900	48	
Cleveland-37W-54			1280
Cleveland (Smith's)			1320
Mexican Big Boll		156	1100
Miller		31	840
Acala			640
Hartsville			560
Allen's Long Staple		52	
Magnolia (Allen)		100	
Sunflower		87	
Vandiver's Heavy Fruiter		63	
Polk (McWilliams)		87	
Half and Half		61	

Fertilizers—It is a difficult matter to decide positively the best and cheapest fertilizer for cotton, although we have found it to be one of the best crops with which to carry on fertilizer work. A study of the tables that follow will show very contradictory results, especially at Poplarville, where the work has not been carried on sufficiently long to obtain averages from a number of years' results At McNeill the addition of potash to a mixture containing nitrogen and phosphorus gave an average of little or no gain in the yield of cotton, though potash alone usually gave slightly increased yields over no fertilizer. At Poplarville for the short time the work has been going on, potash has seemed more essential. Thus in 1920 the average increase in yield of seed cotton from the addition of phosphorus alone was 324 pounds, from nitrogen alone 287 pounds and from potassium alone, 207 pounds ,but strange to say only in two instances did any combination of the three give any greater, if as large yields, as did the phosphorus alone. A study of all the work done at McNeill and Poplarville leads us to the conclusion that phosphorus is the most essential element in a fertilizer for those soils, that acid phosphate is the best source from which to supply it, and that moderate applications of this acid phosphate with rather small amounts of nitrogen will give best and cheapest results, at least under conditions that presently exist. In most instances we believe as good yields of cotton may be had from 300 pounds of acid phosphate

and 100 pounds of cotton seed meal per acre applied in the drill before planting as from any other combination of fertilizers we may use and that it matters little from what source the nitrogen furnished by the cottonseed meal comes.

Some of our best results have been obtained from the use of acid phosphate alone before planting followed by a top dressing of nitrate of soda after the cotton is up. At the same cost per unit of nitrogen we prefer cottonseed meal as its source because it makes a better mechanical mixture with acid phosphate, becomes more gradually available to plants, and is less likely to be lost by leaching. At present prices cottonseed meal competes in price with other nitrogen carriers, but it is so valuable as a feed for animals that its direct use as a plant food ought to be impossible from an economic standpoint and doubtless will be when business conditions right themselves.

From all results obtained with fertilizers at McNeill and at Poplarville we would conclude that under average conditions raw phosphate or soft phosphate rock neither have any great availability and that regardless of their selling price it does not pay to use them; that basic slag has considerably more availability than the other two, but is still behind acid phosphate in this respect and as the prices of the two are not widely different we see no incentive to use the less available kind.

The two tables following give in brief the results with fertilizers at McNeill and Poplarville on which we base the conclusion above outlined:

The table below gives a summary of eight years work with fertilizers under cotton conducted on permanent plats at McNeill. All this work was done in triplicate and each result for each year is an average of the three separate plats, so selected and so placed as to do away, as largely as possible, with variations in yields due to inequalities of the soil.

FERTILIZER PLAT TESTS WITH COTTON.

Number of plat	Fertilizers calculated in lbs. per acre. Cottonseed Meal	Acid phosphate	Kainit	Ground Phosphate Rock	New Jersey Marl	Raw Ground Bone	Lime and Acid Phosphate mixture (Reverted $P_2 C_5$)	Yield of Seed Cotton per acre 1906	1907	1908	1909	1910	1911-a	1912	1913	Average
1	0	0	0	0	0	0	0	480	220	110	153	20	30	233	43	161
2	100	0	0	0	0	0	0	760	436	376	400	90	63	538	210	359
3	0	100	0	0	0	0	0	800	514	744	480	366	166	846	300	527
4	0	0	100	0	0	0	0	620	300	474	186	34	8	480	120	253
5	100	100	0	0	0	0	0	1060	616	644	513	326	292	744	440	580
6	100	100	100	0	0	0	0	860	640	693	520	306	300	764	496	572
7	200	100	0	0	0	0	0	1040	756	684	620	306	370	922	530	653
8	100	200	0	0	0	0	0	1000	666	636	480	254	340	730	453	570
9	100	0	0	0	500	0	0	620	420		360		140		330	374
10	100	0	0	100	0	0	0	840	510		520		220		447	507
11		0	0	0	0	165	0			720						720
12	100	0	0	0	0	0	400			680		460		860		666
13	100	100	0	land parked by cat				1540	1120	920	624	180	490	1055	450	800
14	100	100	100	tle winter 1902-03				1485	1090	870	633	170	510	1135	390	785

a—All applications of fertilizers doubled in and after 1911.

ville in 1920, this being the second year of the same experiment. The results of 1919 were inconclusive on account of wet weather and the boll weevil.

Number of Plat	Fertilizers calculated in pounds per acre	Yield of seed cotton—Series 1, Calculated in pounds per acre	Increase over check	Yield of seed cotton—Series 2, Calculated in pounds per acre	Increase over check	Average increase over check plats
1	240 lbs. Acid Phosphate	1152	306	1080	342	324
2	Check	594	0	594	0	0
3	60 lbs. Calcium Cyanamid	900	306	882	288	297
4	100 lbs. Nitrate of Soda	954	126	774	198	162
5	Check	828	0	576	0	0
6	240 lbs. Acid Phosphate 60 lbs. Calcium Cyanamid	954	126	792	216	171
7	60 lbs. Calcium Cyanamid 200 lbs. Kainit	1080	252	900	288	270
8	Check	828	0	612	0	0
9	240 lbs. Acid Phosphate 200 lbs. Kainit	1008	180	900	288	234
10	240 lbs. Acid Phosphate 60 lbs. Calcium Cyanamid 200 lbs. Kainit	1096	160	1008	306	233
11	Check	936	0	702	0	0
12	240 lbs. Acid Phosphate 100 lbs. Nitrate of Soda 200 lbs. Kainit	972	36	1152	450	243
13	240 lbs. Basic Slag	882	90	756	90	90
14	Check	792	0	828	0	0
15	Check	846	0	738	0	0
16	240 lbs. Raw Phosphate Rock	612	18	774	36	27
17	200 lbs. Kainit	1026	324	900	90	207
18	Check	702	0	810	0	0
19	240 lbs. Basic Slag 60 lbs. Calcium Cyanamid 200 lbs. Kainit	1008	306	990	80	193
20	240 lbs Raw Phosphate Rock 60 lbs. Calcium Cyanamid 200 lbs. Kainit	1062	126	918	216	171
21	Check	936	0	702	0	0
22	240 Acid Phosphate 200 Kainit 50 lbs. Nitrate of Soda, April 10 50 lbs. Nitrate of Soda, June 1	936	0	990	188	94
23	240 lbs. Acid Phosphate 200 lbs. Kainit 50 lbs Nitrate of Soda, June 1 50 lbs. Nitrate of Soda, July 1	1224	270	612	18	144
24	Check	954	0	594	0	0
25	480 lbs. Acid Phosphate 100 lbs. Nitrate of Soda 200 lbs. Kainit	1278	324	918	324	324
26	240 lbs. Acid Phosphate 200 lbs. Nitrate of Soda 100 lbs. Kainit	1458	504	972	306	405
27	Check	954	0	666	0	0
28	240 lbs. Acid Phosphate 100 lbs. Nitrate of Soda 400 lbs. Kainit	1296	342	1026	360	351

Poisoning Against Boll Weevil—Up to 1920 this station had done no work with trying to control the boll weevil with poison and did not plan any such work at planting time this year. Only such cotton was planted here in 1920 as was proposed to be used in specific tests with varieties, fertilizers, spacing, and rotations and, later, when the earliest and heaviest infestation of weevils we had ever seen appeared, we had no cotton that could be used as a check against that on which poison was used. So, in order to make such experimental work as had been started worth the time required to carry it through we felt compelled to poison all cotton or see the weevil the final limiting factor in all yields. As a matter of fact, all our cotton work was done so closely together that to have left any unpoisoned would probably have affected the real influence of the poison on fields where it was used. Our experiments, therefore with poison lack this much of showing its exact value as compared with yields without the poison. However, the results of a near neighbor whose methods of handling his cotton were much the same as ours and who did not use poison at all were taken as a check against our own and ought to throw some light on the actual effects of the poison on cotton yields. This neighbor had ten acres planted to Bank Account cotton and picked 4,300 pounds of seed cotton from the ten acres. In 1919 he had about the same acreage and made a slightly heavier yield than in 1920. In 1920 our average yield per acre with seventeen varieties of cotton was slightly above 1,000 pounds per acre while in 1919 the average yield from 26 varieties was only ninety pounds of seed cotton per acre. This extremely low yield in 1919 was due in part to the fact that extremely wet weather in May did not permit of cultivating and thinning the cotton at the proper time for in that year we had 11.34 inches of rain with 13 rainy days, whereas in May of 1920 we had 2.92 inches of rain which came on ten rainy days.

In 1920 the weevil appeared here in such large numbers that some farmers who had hoed cotton the first time plowed it up and planted the land to other crops. On the station farm we went over the cotton several times picking weevils by hand. But even with this precaution, in many instances stalks bearing from three to five squares had every one punctured. On June 22 we began the application of calcium arsenate with a hand duster made by the Niagara Sprayer Company, and made three applications to all cotton at intervals of about six days. We were able to poison about an acre an hour with one machine and worked about four hours per day, two hours just after sundown and two hours just after day break. We tried to apply about seven pounds of poison per acre, but at first used much more than this in getting the machine regulated. It was difficult to get labor willing to do the work although we paid 40 cents an hour for it. After three applications, the percentage of infestation was so low that we decided to stop for two weeks on all cotton and at the end of this time, or on July 28 started poisoning again on several fields, but at that time were having such frequent showers that nearly all poison was washed off within twenty four hours after application. While one rain came between June 22 and July 1, it did not fall until after poison had been applied more than twenty four hours. We were never able to find any dead weevil as a result of this poisoning and cannot be sure that the low percentage of infestation after the first of July was due to the poison or to natural causes. This insect works in such dubious ways that we frankly admit we do not understand him, but at any rate after the first of August practically no squares were developed regardless of the poison.

Culture—In speaking of South Mississippi we have reference to the Coastal Plains Region thereof, and not to other soil types that compose a part of this territory. As a rule these Coastal Plains soils are sandy-loams easily prepared and cultivated and from a physical standpoint among the most desirable soils in the state. As a rule they lack organic matter and also phosphorus and nitrogen. Every effort should be made to increase their natural supply of organic matter by growing crops in rotation with cotton that will have this effect. We have found none that accomplish this end more quickly than corn and velvet beans under a two-year three-crop system. A rotation of cotton, corn and cowpeas and oats followed by cowpeas under a three-year five-crop system is also very effective as was conclusively shown by careful experiments carried on for a number of years at McNeill. We also tried at McNeill a method of growing cotton every year with vetch in the

winter and early spring, but found this too expensive on account of the fact that the vetch did not reseed well and, too, occupied the ground so late in the spring that the cotton got a late start and would produce nothing under boll weevil conditions. We believe this reseeding of the vetch might be improved by liming the land, so have started at Poplarville an experiment of growing it with cotton and corn in rotation on land well limed. Under the same conditions we are also using bur clover with the hope that it may be even better than vetch.

Under a system of well conducted rotations, we believe acid phosphate alone applied in the drill before planting at the rate of from 200 to 400 pounds per acre, followed after the cotton is up and thinned by a top dressing of nitrate of soda at the rate of 50 to 100 pounds per acre will give the cheapest yields of cotton so far as fertilizers are concerned. Rows placed three and one-half feet apart are very satisfactory and we prefer to put the acid phosphate in the drill and bed upon it some days in advance of planting so as to give a firm seed bed in which the seed will germinate quickly when planted. On the naturally well drained soils of the section these beds should be dragged down to where the top is only slightly elevated above the average of the field. A Ledbetter one-seed planter so set as to drop the seed as close together as possible will give a stand easily thinned and at same time require much fewer seed than the old fashioned planters. The concensus of opinion seems to be that close spacing in the drill gives larger yields than wider spacing, but a hoe's width apart is about as close as it can be cleaned satisfactorily. Experiments here this year on spacing were favorable to the close spacing, hoe's width, or nine inches, giving 1,216 pounds per acre, fifteen inches 1,108 pounds, and 24 inches 1,010 of seed cotton per acre respectively.

BULLETIN No. 197 JANUARY, 1921

CORN EXPERIMENTS

By
H. B. BROWN

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CORN EXPERIMENTS

College Experiment Station

By H. B. BROWN.

The State of Mississippi produced 64,768,000 bushels of corn on 3,701,000 acres in 1920. This was an average yield of 17.5 bushels per acre. In 1919 the yield was 15 bushels, and in 1918, 17 bushels. These averages are much too low. Yields of more than a hundred bushels per acre have been made in the State in a number of instances. The average should be raised and could be by the use of better adapted varieties, better tillage, and especially, by improving the fertility of the soil.

The Mississippi Experiment Station has been carrying on a series of corn experiments for a number of years. The results from these experiments have been published in bulletins from time to time, the last being published in 1915. This covered work done from 1910 to 1914. The present bulletin gives in brief form, certain data secured at the College Station since 1915. It also contains culture recommendations for the central and eastern parts of the State. Considerable other and more technical data on corn breeding has been secured and will be published later.

VARIETY STUDIES.

The Experiment Station secures seed of and tests each year, about twenty of the leading corn varieties grown in the South. This affords reliable information in regard to the values of different varieties for our conditions and puts the Station in position to advise growers as to satisfactory varieties for various localities. An effort is also made to try out, or plant for observational purposes at least, all new or highly advertised varieties. From this testing some valuable new strains may be secured, while, on the other hand, the growers may be advised against planting strains or varieties not adapted to their conditions.

Certain varieties are better adapted to a given region than are others. The best yielding varieties in our tests the past ten years have averaged more than 30 per cent higher than the poorer varieties in the same tests. Some varieties yield better, comparatively, when planted early, and others when planted late. Some are bet-

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The corn experiments during the years 1911 to 1914 inclusive, were conducted by J. R. Ricks and E. C. Ewing. C. B. Anders assisted in the experimental work in 1919 and 1920.

ter adapted to rich lands, others to thin lands, etc. Consequently, good local varieties are usually better yielders than varieties brought in from a distance. If seed of a satisfactory local variety cannot be obtained, seed of some variety recommended by the nearest experiment station as being adapted to the region should be secured from a reliable seedsman and given a trial.

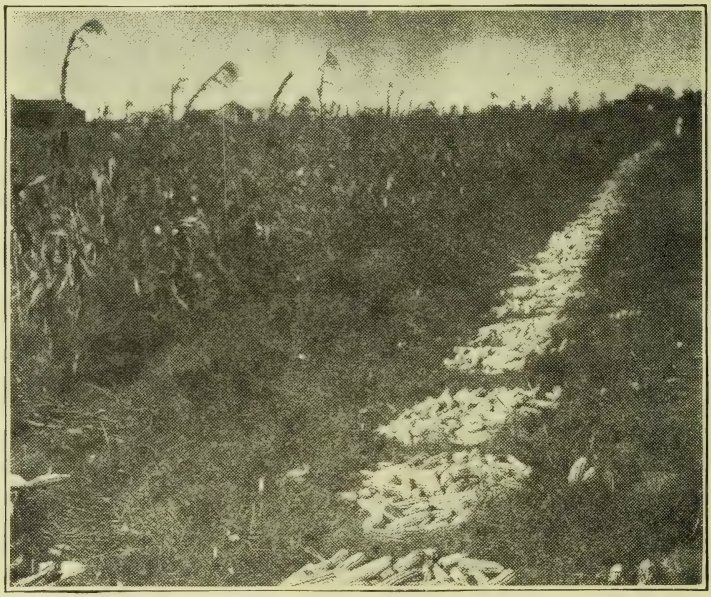


Fig. 1. Corn Variety Test, 1920.

Valley Land Variety Tests: The following table (Table 1) shows the comparative yields of the leading varieties used in the College Station valley land variety tests the past ten years. The land on which these tests were made was valley land of only medium fertility—land capable of producing from 40 to 50 bushels of corn per acre under favorable weather conditions. No commercial fertilizers were used. Light applications of barnyard manure were made from time to time. No effort was made to secure phenomenal yields. It was thought that moderate yields produced under normal conditions would be of more value comparatively. Planting was done from March 20 to April 1. Preparation of soil, planting, and cultivations were in accordance with practices recommended in another part of this bulletin. Except in 1920, varieties that were in the tests but one year were not included.

TABLE No. 1.—CORN VARIETY STUDIES, COLLEGE STATION.

VARIETY	BUSHELS EAR CORN PER ACRE					BUSHELS GRAIN PER ACRE				
	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
Alabama Yellow						38.56	48.58	38.0		
Batts' Four-Ear	34.1	35.29	34.3	41.7						
Boone County White (Station)	22.1	31.1	32.7	44.5	34.6	44.11	46.28	41.5		
Cocke's Prolific	31.5	38.1	44.2	53.8	35.4	44.4	44.93	41.5	44.3	
Cocke's Prolific (Allen)									45.2	54.4
Chisolm	26.6	32.25								
Davis' Poor Land	31.1	32.9	38.3	48.4	31.6					
Florida Flint		32.53	36.9	44.5	31.0		43.51	40.8	40.7	47.5
Gerrick										51.1
Goliad					28.8	25.32	45.39		36.75	
Godby's Poor Land	37.9	29.63	37.5							
Gourd Seed	31.1	28.6	37.6							
Hastings (Hastings)	34.1	35.6	37.5	46.6	32.2			37.2	42.5	55.3
Huffman	33.8	30.9								
Johnson's Prolific								37.5	44.2	
Johnson County White						38.41	38.96		40.3	42.4
Jones x Vardaman							48.70	41.5	44.2	
Jones' Prolific			36.9	50.7	35.0	32.92				
Jones' Prolific (Station)						46.32	43.21	40.21	42.6	49.8
Leaming		34.22	31.5	35.5						
Marlboro	30.8	36.75			34.8	42.14	41.20	37.5	38.0	48.3
Marlboro (Coker)										46.1
Mosby (Ewing)										53.4
Mosby (Station)	30.0	30.8	37.0	49.1	33.3	38.8	43.8	43.1	45.1	45.0
Mosby (Rhodes)				47.7		37.92			39.2	
Mosby (Woodruff)								39.4	40.5	49.9
Mosby (Carr's)	32.3	32.21	34.1							
Mosby-553										52.6
Munson	31.5	28.06	36.2	42.8						
New Era			35.6	44.0	33.5					
North Carolina Prolific			36.7	52.8	31.5			41.5	41.1	42.1
Paymaster (Harpeth)								46.9	49.7	55.3
Paymaster (Station)									49.4	53.8
Rockdale		30.25	36.1	39.7						
Shoe Peg	30.8	27.62							44.5	47.2
Simmons' Prolific										
Square Deal	28.9	31.95	29.7							
Sure Cropper	25.0	31.63								
Tennessee Red Cob (Station)	35.3	35.9	31.2	59.4	35.6	41.6	52.6	41.6	48.7	47.4
Tennessee Red Cob (Rizer)								35.7	48.5	
Tennessee Red Cob-72										56.9
U. S. D. A.-195							47.88		42.2	
Vardaman (Vardaman's)			39.2	49.8	37.9	40.58	48.34			
Vardaman (Station)						42.57	48.91	42.88	44.0	46.1
Williamson					28.9	33.97				
Yellow Dent	27.7	30.68	26.3							

By studying the yields of the different varieties as shown in Table 1, a good idea of their relative value may be gained. Any variety that ranks high for several years is evidently a good variety for growing under conditions similar to those under which the tests were made. Vardaman, Jones' Prolific, Station Tennessee Red Cob, and Cocke's Prolific ranked high in the tests of five or more years. Paymaster, and other selections from Tennessee Red Cob, and certain selections from Mosby have made a good showing the last two or three years.

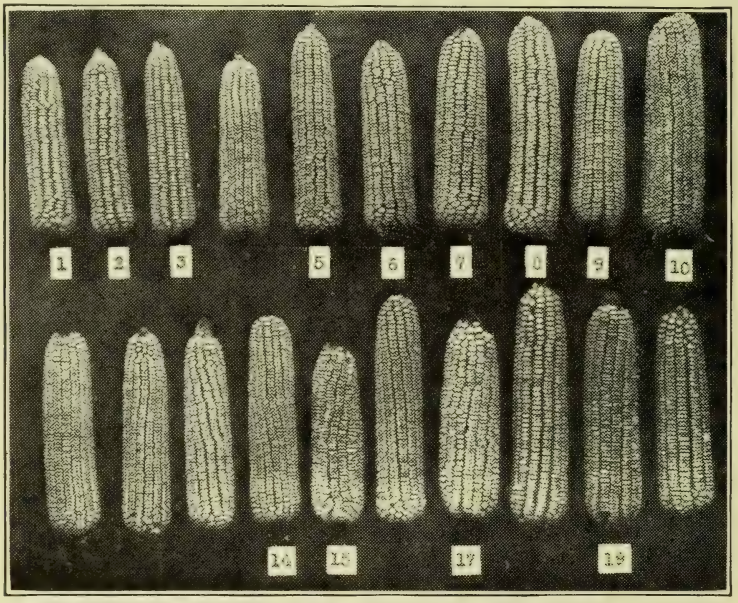


Fig. 2. Typical Ears of the Varieties as They Appeared in the 1920 Test.

1. Jones' Prolific
2. Simmons' Prolific
3. Cocke's Prolific
4. Hasting's Prolific
5. North Carolina Prolific
6. Marlboro (Wannamaker)
7. Marlboro (Coker)
8. Gerrick
9. Florida Flint
10. Champion Early White Dent
11. Johnson County White
12. Station Mosby
13. Mosby (Ewing)
14. Mosby-553
15. Mosby (Woodruff)
16. Vardaman
17. Tennessee Red Cob (Station)
18. Tennessee Red Cob-72
19. Paymaster (Station)
20. Paymaster (Harpeth)

TABLE No. 2.—CORN VARIETY STUDIES, COLLEGE STATION, 1919

VARIETY	Lbs. per plat (field wgt.)	Per cent of grain.	Total Yield bushels gr'n per acre.	Bushels good grain per acre.	Bushels of damaged grain per acre.	Bushels worthless grain per acre.	Value good gr'n @ $1.50 per bushel.	Value damaged grain @ $1.00 per bushel.	Total Money value.	Rank in Money val.
Mosby (Station)	222.5	88.3	45.1	42.7	2.1	.1	64.05	2.10	66.15	6
Mosby-7104	211.5	88.2	42.8	40.9	1.6	.3	61.35	1.60	62.95	15
Mosby-773	223.0	86.6	44.3	41.2	2.8	.1	61.80	2.80	64.60	11
Mosby (Rhodes)	195.5	87.3	39.2	37.0	2.0	.1	55.50	2.00	57.50	24
Mosby (Woodruff's)	196.5	89.9	40.5	36.2	3.7	.5	54.30	3.70	58.00	23
Cocke's Prolific (Station)	230.5	83.8	44.3	40.7	3.3	.2	61.05	3.30	64.35	12
Cocke's Prolific (Allen's)	233.5	84.3	45.2	40.2	4.6	.3	60.30	4.60	64.80	10
Marlboro	197.5	83.9	38.0	36.5	1.3	.2	54.75	1.30	56.05	27
Piedmont	221.5	88.3	44.9	41.7	3.1	.0	62.55	3.10	65.65	7
North Carolina Prolific	209.0	85.7	41.1	37.1	3.8	.2	55.65	3.80	59.45	20
Hasting's (Station)	229.0	87.8	46.1	44.7	1.1	.3	67.05	1.10	68.15	3
Hasting's (Hasting's)	210.5	87.9	42.5	40.2	1.6	.6	60.30	1.60	61.90	17
Jones' Prolific	219.5	84.6	42.6	38.4	4.1	.0	57.60	4.10	61.70	18
Jones x Vardaman	227.0	84.9	44.2	40.2	3.9	.2	60.30	3.90	64.20	13
Vardaman (Station)	219.0	87.5	44.0	40.9	2.7	.4	61.35	2.70	64.05	14
Johnson's Prolific	217.0	88.8	44.2	42.2	1.7	.3	63.30	1.70	65.00	9
Simmon's Prolific	227.0	85.4	44.5	41.9	2.6	.0	62.85	2.60	65.45	8
U. S. D. A. 195	218.0	84.4	42.2	40.2	1.7	.3	60.30	1.70	62.00	16
U. S. D. A. 206	204.0	83.6	39.1	31.9	6.9	.3	47.85	6.90	54.75	29
Paymaster (Station)	252.5	85.2	49.4	38.3	10.6	.4	57.45	10.60	68.05	4
Paymaster (Harpeth)	248.5	87.2	49.7	41.5	8.0	.0	62.25	8.00	70.25	1
Tenn. Red Cob (Station)	249.5	85.0	48.7	41.7	5.8	1.0	62.55	5.80	68.35	2
Tenn. Red Cob (Detas)	231.0	82.1	43.5	37.2	5.7	.6	55.80	5.70	61.50	19
Tenn. Red Cob (Rizers)	250.5	84.3	48.5	36.9	11.0	.4	55.35	11.00	66.35	5
Florida Flint	207.5	85.5	40.7	36.3	4.0	.3	54.45	4.00	58.45	22
Johnson County White	209.5	83.8	40.3	33.0	7.1	.2	49.50	7.10	56.60	25
Surcropper	208.5	82.8	39.6	30.9	8.5	.1	46.35	8.50	54.85	28
Yellow Dent (Ferguson's)	214.5	84.8	42.0	34.5	4.8	2.4	51.75	4.80	56.55	26
Goliad	212.5	83.8	40.9	38.3	1.8	.7	57.45	1.80	59.25	21

TABLE No. 3.—CORN VARIETY TEST, COLLEGE STATION, 1920.

VARIETY	Lbs. per plat (field wgt.)	Per cent grain.	Per cent of damaged ears (by weight.)	Per cent of worthless ears (by weight.)	Bushels of good grain per acre.	Bu. of damaged grain per acre.	Money val. good grain @$1.00 per bushel.	Money val. dam. grain @ $0.70 per bushel.	Total Money value of grain.	Rank in Money val.
Simmons' Prolific	310	86.5	4.6	1.4	45.05	2.2	45.05	1.54	46.59	13
Jones' Prolific	329.5	85.3	4.0	0.5	47.84	1.97	47.84	1.37	49.21	9
Cocke's Prolific	360.5	85.0	3.4	0.6	52.52	1.86	52.52	1.30	53.82	3
Gerrick	348.5	83.0	3.1	0.8	49.57	1.58	49.57	1.11	50.68	8
Hastings	357.5	87.1	2.3	0.4	54.03	1.29	54.03	.90	54.93	2
North Car. Prolific	269	89.1	5.2	1.4	39.91	2.22	39.91	1.55	41.46	19
Vardaman	301.5	86.6	5.5	0.8	43.63	2.54	43.63	1.78	45.41	16
Station Mosby	289	87.9	2.6	0.7	43.86	1.18	43.86	.83	44.69	17
Mosby (Ewing)	349	86.8	3.5	0.9	51.52	1.89	51.52	1.33	52.85	5
Mosby 553	334.5	89.0	4.6	0.5	50.24	2.44	50.24	1.71	51.95	7
Mosby (Woodruff)	312.5	90.0	6.1	0.5	46.84	3.05	46.84	2.13	48.97	10
Marlboro (Coker)	329	83.8	4.1	0.6	44.05	2.03	44.05	1.42	45.47	15
Marlboro (Wannamaker)	336.5	82.6	4.2	0.4	46.22	2.10	46.22	1.47	47.69	11
Paymaster (Station)	331	85.0	9.8	1.8	48.81	4.95	48.81	3.46	52.27	6
Paymaster (Harpeth)	376	83.3	7.8	1.1	50.96	4.35	50.96	3.04	53.00	4
Tenn. Red Cob (Station)	319.5	84.8	8.3	0.8	43.34	4.01	43.34	2.81	46.15	14
Tenn. Red Cob-72	376	85.0	5.2	0.5	53.97	2.99	53.97	2.09	56.06	1
Florida Flint	316	85.2	5.1	1.1	45.09	2.48	45.09	1.74	46.83	12
Johnson Co. White	286	84.5	10.7	1.9	37.75	4.62	37.75	3.23	40.98	20
Cham. Early White Dent	288	84.7	8.5	1.9	38.97	3.7	38.97	2.59	41.56	18

Tables 2 and 3 show, in some detail, results from tests made in 1919 and 1920. These tests were conducted as outlined above. Each year the corn gathered from the test rows was piled in separate piles, graded and weighed. Grade 1 contained only sound ears; grade 2 contained ears damaged by having some rotten grains; and grade 3 contained ears that were entirely rotted and worthless. It will be observed by referring to the tables that the early Northern varieties, such as Johnson County White and Champion Early White Dent, produced much damaged and rotten corn, and that they also ranked low in yield. A considerable quantity of seed of northern varieties is sold in Mississippi by local seed dealers on account of the fact that it is less trouble to get good looking seed in neat packages from northern seedsmen than from local sources. Some growers, too, plant early maturing varieties with the idea of getting early feed. As a result, they get feed a few days earlier but short in quantity at least twenty-five per cent. The planting of early varieties is to be discouraged.

Table 4 gives data on the fruiting of the different varieties in the test in 1920. This corn was checked, the hills being 3½ feet apart each way, and was thinned to two stalks in a hill. The soil was of medium fertility. Wet weather early in the season damaged the crop considerably.

TABLE No. 4.—FRUITING OF VARIETIES IN CORN VARIETY TEST, 1920

VARIETY	No. stlks	Lbs. per plat	% barren stalks	% one ear stalks	% two ear stalks	Date of tasseling	Date of silking
Champion Early White Dent	588	288	4.9	90.9	4.2	June 20	June 23
Johnson Co. White	609	286	5.9	90.1	4.	June 21	June 24
Florida Flint	646	316	3.	69.6	27.4	June 22	June 26
Tenn. Red Cob-72	620	376	2.3	78.6	19.1	June 28	July 3
Tenn. Red Cob (Sta.)	577	319.5	6.7	88.	5.3	June 25	June 28
Paymaster (Harpeth)	654	376	1.5	76.6	21.9	June 22	June 24
Paymaster (Sta.)	607	331	2.	75.8	22.2	June 22	June 24
Marlboro (Wannamaker)	635	336.5	4.3	63.4	32.3	June 28	July 4
Marlboro (Coker)	626	329	6.1	62.1	31.8	June 28	July 1
Mosby (Woodruff)	622	312.5	2.8	74.6	22.6	June 25	June 29
Mosby-553	669	334.5	3.	71.2	25.8	June 25	July 2
Mosby (Ewing)	660	349	4.	60	36.	June 25	June 28
Mosby (Sta.)	619	289	3.3	82.1	14.6	June 25	June 29
Vardaman	622	301.5	3.5	80.5	16.	June 28	July 3
North Carolina Prolific	618	269	1.	83.	16.	June 22	June 27
Hastings	639	357.5	1.9	32.8	65.3	June 28	July 7
Gerrick	608	348.5	2.4	46.4	51.2	July 2	
Cocke's Prolific	610	360	1.8	39.3	58.9	June 24	June 30
Jones Prolific	643	329.5	.6	48.2	51.2	June 24	June 30
Simmons' Prolific	621	310	3.6	52.9	43.5	June 24	June 30

Hill Land Tests. Table 5 shows the yields from tests conducted on hill land low in fertility. The planting was done about April 1. Rows were 3½ feet apart, and stalks were 3½ feet apart in the row. The yields are low as may be expected from corn grown on

such land. Growing corn on thin land is not profitable and is not to be advised. On account of the fact that some people find it necessary to grow corn under such conditions, the best adapted varieties should be known. These tests are being conducted to secure this information. The data secured up to date are too meager for any very definite recommendations. The crop has been a total failure about half of the years tried. From the information we have, it appears that a large, vigorous growing variety, such as Tennessee Red Cobb or Cocke's Prolific, does best under such conditions.

TABLE No. 5.—CORN VARIETY TESTS ON HILL LAND

Plat No.	VARIETY	Bushels per acre 1918	Bushels per acre 1920
1	Alabama Station Yellow	11.3	
2	Cocke's Prolific	16.6	17.9
3	Florida Flint		17.3
4	Hickory King	14.2	15.2
5	Hastings	14.2	18.3
6	Johnson County White		14.0
7	Jones' Prolific	16.5	17.3
8	Marlboro	14.7	15.0
9	Mosby (Station)	14.2	17.0
10	North Carolina Prolific	16.7	18.7
11	Paymaster (Station)		18.0
12	Tennessee Red Cob (Station)	12.3	18.7
13	Vardaman	15.7	17.8

TABLE No. 6.—LATE CORN VARIETY TESTS ON VALLEY SOIL.

Plat No.	VARIETY	Bu. per A. 1919, planted July 17	Bu. per A. 1920 planted July 1
1	Cocke's Prolific	27.5	26.2
2	Ferguson's Yellow Dent	19.9	
3	Florida Flint	22.6	
4	Goliad	41.4	32.4
5	Hastings	28.2	27.0
6	Hickory King		20.8
7	Jones' Prolific	25.6	25.4
8	Johnson's Prolific	29.9	
9	Jones X Vardaman		26.8
10	Laguna		40.0
11	Mexican June	31.0	30.7
12	Mosby (Woodruff)	19.4	
13	Mosby (Station)	23.1	21.0
14	North Carolina Prolific	20.8	
15	Paymaster	24.4	24.0
16	Simmons' Prolific	24.1	
17	Tennessee Red Cob (Station)	26.4	24.0
18	U. S. Dept. Agr. Sel. 206	17.3	
19	U. S. Dept. Agr. Sel. 195	19.5	
20	Vardaman	27.3	

Varieties for Late Planting. Table 6 shows yields from certain varieties planted in July. The first of July is too late for corn planting if the best results are to be secured, but at times it may

be desirable to plant a catch crop as late as this. The first week in June is a better date for planting than the first of July. When corn is planted late, the quality of grain produced is usually poor, but this varies with different varieties. Jones' Prolific, Cocke's Prolific, Laguna, Mexican June, and Hastings produced corn of fair to good quality in the tests conducted. Goliad, also, had solid ears, but they were not dry at gathering time due to the lateness of the variety. Laguna, Mexican June, Cocke's Prolific and Goliad are recommended for late planting.

CORN BREEDING.

Corn breeding in its broad sense is any treatment that leads to an improvement in the inherent qualities of a strain of corn. Various methods of breeding are in use—mass selection, ear to row testing, hybridization or crossing, and the isolation of desirable strains by inbreeding.

Mass Selection. The simplest type of corn breeding, and the one of most importance to the average grower, is mass selection. This consists simply in choosing a number of ideal plants and mixing their seed, or putting the seed in one mass.

The characteristics of a variety or strain of corn are easily modified. If one has fixed in mind a certain type of plant and selects toward that type, or picks out in the field for a few years stalks that are nearest like the form in mind, it is possible to mold or change the strain to almost any desired form. All varieties may be brought to uniformity in this way, and some may be made to yield better.

The ideal plant will differ with the variety and differs somewhat in different localities. Over a large part of the South it is best to select a heavy stalk with two medium large ears. The ears should be of medium height with rather short shanks, but shanks should be long enough to allow the tip of the ear to hang downward; shucks should be long and fit snugly over the end of the ear so as to protect it from moths, weevils, etc. A cylindrical ear with deep, closely fitting grains and a well filled butt and tip is generally considered desirable.

With the desired type of stalk in mind, the farmer goes into his field to select seed. He may gather the ears from the selected stalks or simply tag the stalks and gather later. Results will probably be secured more quickly if ears from a few stalks approaching the ideal most closely are kept to themselves and planted in an isolated seed patch, further selections being made from this patch the following year and continued for a series of years. By following this plan, it is possible to increase temporarily, at least, the yield of all varieties, and in the case of some strains, to get continued increase

each year for a number of years. To avoid the danger of the harmful effects of inbreeding, it is a good plan to get seed occasionally of another good strain of the same variety and mix the two.

The production of new and better strains of corn by progeny, or ear to row work, has been advocated, but recent experiments by several experiment stations have shown this to be of doubtful value unless used in connection with hybridization work. Certain of the ears selected do produce superior rows, but if the remainder of the seed from the original plant is planted in an isolated patch and the strain multiplied, then tested in comparison with the original variety from which the selection was made, it will be found to be a poorer yielder than the original in practically every case. Why this is, is rather difficult to explain, but it is probably due to one of two causes—either the original plant from which the row was planted was a hybrid which gave poorer progeny when multiplied in an isolated patch, or there was too much inbreeding in the isolated patch since all the plants were related, coming from a single plant.

If two high yielding progeny row strains are hybridized or crossed, the resulting hybrid strain will be, in most cases, a high yielding strain the first year after the cross is made. After this there will be a deterioration unless a new cross is made each year. Two strains of corn are easily crossed by planting them in alternate rows and detasseling one of the strains before the tassels have shed any pollen dust.

The Use of Hybrid or Crossed Seed. Several of the leading corn breeders of the northern and eastern states have obtained increased yields by planting hybrid seed, or seed produced by crossing different strains of corn. In 1912 the Mississippi Experiment Station started an experiment to determine the value of crossing the leading southern varieties as a means of increasing yields. Table 7 shows, in brief, the results obtained from the nine years' work. The different varieties were crossed by planting them in rows alternating with rows of some one variety that was to be used as the male or pollen parent, and detasseling all but the pollen parent rows. About twenty-five varieties have been tried in different combinations with varying results. As a rule, the hybrid or crossed seed produced plants that yielded better than plants from the seed of either parent, but the gains were not large, as shown in table 7. In most cases the gain was not enough to pay for the extra cost of producing the hybrid seed. Whether or not the crossing will pay will depend on the combination made. It will likely not pay to cross varieties that differ widely in characteristics, or that appear to be mixed. Mixed varieties are of hybrid constitution and consequently already have the vigor that comes from crossing. Varieties or strains that have been inbred, or rigidly selected to a certain type

for a number of years, will likely give increased yields if crossed. Most of our commercial varieties are so mixed in tye that crossing them gives but little increase in yield.

TABLE No. 7.—EIGHT YEARS RESULTS FROM HYBRID SEED CORN EXPERIMENT

Year	BEST YIELDING CROSS	Yield in Bushels	Gain over av. parents bu. per acre	Gain over best yielding parent, bu. per acre
1913	Florida Flint x Mosby	58.65	5.15	2.4
1914	Vardaman x Mosby	36.96	8.12	6.86
1915	Florida Flint x Mosby	35.7	4.2	3.5
1916	Jones x Mosby	31.95	5.28	2.85
1917	Johnson Co. White x Vardaman	44.48	7.28	3.84
1918	Vardaman x Jones	49.14	4.48	1.12
1919	Ala. Sta. Yellow x Fla. Flint	32.2	.95	—.63
1920	Hickory King x Cocke	50.8	8.0	1.2

Effect of Inbreeding. During the past few years the writer has done considerable inbreeding work with corn. Several varieties and strains have been self pollinated for one, two, or three years. The effect varied considerably with different varieties, but in all cases there was a marked reduction in vigor and yield the first generation after selfing. The selfed strains, as a rule, yielded less than half as much as the original open pollinated strain. Germination was poorer; the stalks lower, more slender, weaker in every way, and more susceptible to disease. After the first year the deterioration due to selfing was much less comparatively, but some varieties became so weak that it was a difficult matter for them to produce enough viable seed to propagate themselves. Certain varieties, like Paymaster, for instance, were not so seriously affected by the inbreeding and were able to make fair yields notwithstanding. The varieties that stood up best under inbreeding were, as a rule, varieties that had been ranking well in yields in other tests.

Figure 3 shows stalks from open pollinated and inbred strains which grew in adjoining rows. No. 1 is a stalk from Laguna, open pollinated; No. 2 is Laguna, self pollinated one year; No. 3 is Paymaster, open pollinated; and No. 4 is Paymaster, self pollinated one year. Laguna No. 1 produced at the rate of 46.9 bushels per acre, while Laguna No. 2 yielded only 5.3 bushels. Paymaster No. 3 produced at the rate of 39.4 bushels per acre; Paymaster No. 4 yielded 30.1 bushels.

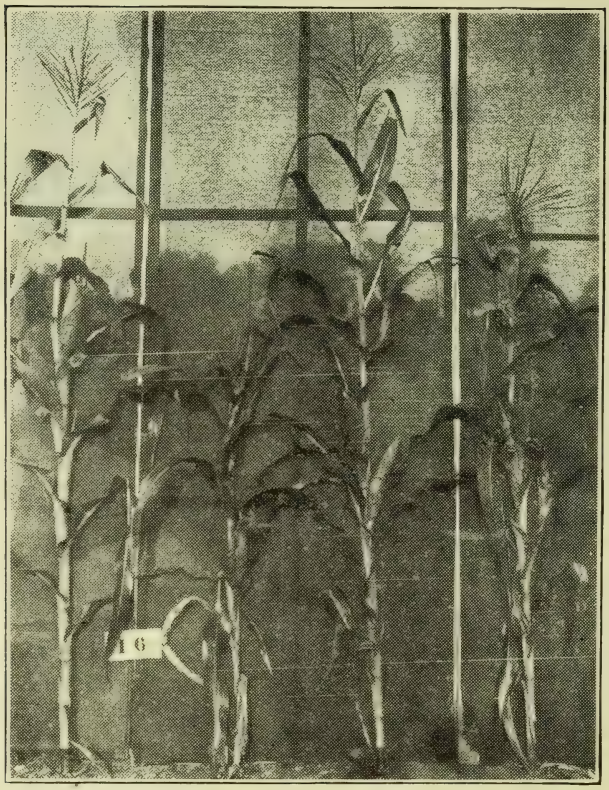


Fig. 3. Effect of Inbreeding.

1. Laguna, open pollinated
2. Laguna, self pollinated
3. Paymaster, open pollinated
4. Paymaster, self pollinated

Use of Inbred Strains in Breeding Work. A new method of corn breeding that is attracting the attention of corn breeders at present and which promises to yield good results in the future, is a method based on selection in self fertilized strains. The method in brief is this: Certain plants in some well established variety are self pollinated by hand. Progenies are grown from these self fertilized ears by planting each ear in a separate row. Some of the better plants in these rows are self pollinated, also, and more progeny rows grown the following year. This process is continued until pure strains are produced. From self fertilization or inbreeding, there results, as was pointed out above, a rapid deterioration in size, vigor, and yielding power of the plants. When the strains become

pure, genetically, the deterioration ceases, and fixed strains of very uniform qualities are secured. These different strains differ considerably; some are decidedly more vigorous and better yielders than others. Even the best of these pure strains are poor yielders compared with commercial varieties in their hybrid condition. But all of these pure strains when crossed with each other regain their former vigor and yielding power, and some of them when crossed in certain combinations produce higher yielding strains than can be secured in any other way. The reduction to purity in the inbreeding process brings to the surface, or makes apparent, all the characteristics that the strains carry. This makes it possible to select strains that possess only desirable qualities. Hybrids resulting from the crossing of strains possessing only desirable qualities are sure to have only good qualities. Producing varieties of this sort is the goal of corn breeding.

Although these new methods of corn breeding promise much, they are probably too much trouble for the busy farmer. Simple field selection, as outlined above, is likely the best and most practical method for him to follow.

CORN CULTURE.*

Save the Old Corn Stalks and Dead Grass. Most of the soils of Mississippi are badly deficient in humus, or organic matter. On account of the mild climate and abundance of moisture, bacterial action in the soil goes on the greater part of the year. Humus produced by the rotting of vegetation turned into the soil is consumed sooner than in northern regions. This renders our soils low in organic matter and makes it necessary for a farmer to turn much vegetable matter into the soil in order to keep it productive. Cover and green manure crops should be grown wherever at all convenient, and under no circumstances should corn stalks, cotton stalks, or old grass and weeds be burned. By running over them with a disc harrow, or stalk cutter, or both, they can usually be turned under so that they will not give much trouble when cultivating the crop following.

Breaking the Land. Corn land should be flat broken to a depth of 6 inches or more. Large plows are preferable, especially where there is much vegetation to turn under. Except where the land washes badly, it is better to break land in the fall or early winter. Early plowing is advantageous in that it brings about a fine state of pulverization of the soil due to the action of frost and freezes; roots of some noxious weeds and grasses are killed; many lar v

*A part of the data on which the recommendations given in this discussion are based, is to be found in Corn Bulletin No. 170, Mississippi Agricultural Experiment Station.

injurious insects are destroyed; vegetation that is turned under has a better chance to decay before crop time; and the farmer gets ahead with his work so that he can get his crop in quickly when seasonable weather comes. Land should not be plowed when it is too wet to crumble freely.

In some corn growing districts the land is not broken for corn but is planted in deep furrows made by a lister. This is an economical way of growing corn but is better adapted to regions of light rainfall. In Mississippi the rainfall is comparatively heavy during the early part of the corn growing season, and corn in furrows suffers.

Preparation of Seed Bed. If land is broken during the fall or winter, it can usually be put in good shape for planting by running over it once or twice with a disc harrow just before planting, and then leveling it with a smoothing harrow. If land is plowed in the spring, a smoothing harrow alone will usually be sufficient to make a good seed bed if the harrowing is done a few hours after breaking. If breaking is done in late spring, much more work may be necessary to get the land in order. It may be necessary to use roller and drag in addition to harrows. It pays to pulverize the soil well. Corn planted among clods will not germinate satisfactorily; the stand will be poor; and it will be a difficult task to cultivate the young plants properly.

When to Plant. Corn may be planted in the spring as soon as the ground dries out and becomes sufficiently warm. At the College Station this usually occurs during the last two weeks of March. Corn planted in March or the first part of April usually yields better than when planted later. If planted from the middle of April to about the 20th of May, bud worms destroy so many of the young plants that it is almost impossible to get a good stand. Corn planted the first half of June does well, but, as a rule, does not yield more than 75 per cent as much as March corn.

How to Plant. Most corn land should be planted flat. Low wet land may produce better if planting is on low beds. A bed wide enough to accommodate two rows is probably the best size.

Several experiments have indicated that slightly greater yields may be obtained from corn planted in drills rather than in checked hills, which can be plowed both ways; but drilled corn requires more hoeing, especially if the land is foul. Unless labor is very cheap and the land easily kept free of grass and weeds, it is more economical to plant in hills.

In choosing the width of rows, one should be guided by the cultivators available. The middle between the rows should not be wider than can be covered thoroughly and economically. A good width is three and one-half feet.

The space in the drill or number of stalks to leave in a hill varies with the fertility of the soil. For land of moderate fertility a good spacing is approximately two feet apart in the drill, or two stalks per hill in the case of checked corn. Fewer stalks should be left on thin land and more on fertile.

The depth of planting should be regulated in accordance with the amount of moisture in the soil. The seed must be placed deep enough to have sufficient moisture for germination. Planting the seed deep has been thought by some to produce deep rooted plants, but experiments have shown that this is not true.

In planting it is necessary to use enough seed to insure a good stand. A bushel to four acres is recommended. This is more than necessary if every grain makes a stalk, but some should be allowed for insect destruction. It is more economical to take out extra stalks than to grow a crop with a poor stand. Replants, or hills planted in skips where corn failed to come up, seldom amount to much. The first planting gets the start, shades the replant stalks, and robs them of water and mineral nutrients.

Cultivation. The chief purpose in cultivating corn is to keep down grass and weeds. Several experiments have shown that scalping the surface of the ground with hoes to prevent the growth of grass and weeds does practically as much good as ordinary cultivation—yields are about the same. Cultivation, also, helps in conserving moisture while the plants are small, reduces loss of water in the "run-off" after rains, and serves to aerate the soil.

The implements that will accomplish the purposes of cultivation most effectively and most economically are, of course, the ones to use. A spike-tooth harrow run angling across the rows is usually the best implement to use first. It does good work in breaking crusted soil and destroys young weeds. The ground should be stirred to some depth the first two plowings. Gangs bearing three or four small shovels each do excellent work and are easily operated if the land is in good condition, but if the ground is hard or there is much grass to destroy, plows with fewer gangs and larger shovels will do better work. Grass and weeds must be kept down at all hazards, and an implement used that will do this. All experiments have shown that deep plowing after corn gets some size, say about a foot high, is not so helpful as shallow plowing. Seventy-five per cent of the roots of corn plants are in the plowed soil and extend entirely across the middles between rows after the corn is a foot high. Consequently it is easy to see why deep cultivation is not advisable. Cultivators bearing sweeps or spring-tooth attachments are best for later cultivation unless a heavy growth of grass and weeds makes deeper cultivation necessary.

It is usually a good practice to cultivate corn four or five times at weekly intervals, or after hard rains. Cultivation should be con-

tinued until tasseling begins. Until the corn gets too tall to straddle the rows, satisfactory work may be done with two-horse implements. They are much more economical than one-mule plows.

Fertilizers. There is no fertilizer better than barnyard manure. It supplies both the mineral nutrients needed and affords an ample supply of humus. More live stock should be kept on Mississippi farms so that more manure will be produced, and better care should be taken of that which is made.

Crimson clover used as a cover crop and turned into the soil in May serves to supply nitrogen and humus to the soil and is satisfactory fertilizer for late corn on land that is not lacking in phosphorus or potash. Cowpeas planted in corn at the last cultivation add considerable nitrogen to the soil and are profitable.

TABLE No. 8.—NITROGEN FERTILIZERS UNDER CORN—COLLEGE STATION, 1919.

FERTILIZER	Early applicat'n 5/23/19	Late applicat'n 6/17/19	AVERAGE
Cyanamid, 75lb per A	262 lb	235 lb	248.5lb—33.1 bu. per A.
Ammonium Nitrate, 75lb per A	292 lb	311.5lb	301.75lb--40.2 bu. per A.
Check			280lb
Cyanamid, 100lb per A	294.5lb	322.5lb	308.5lb—41.1 bu. per A.
Ammonium Nitrate, 100lb per A	*239 lb	362.5lb	362.5lb—48.3 bu. per A.
Check			214lb
Cyanamid, 125lb per A	320.5lb	319.5lb	320 lb—42.7 bu. per A.
Ammonium Nitrate 125lb per A	339 lb	349 lb	344 lb—45.9 bu. per A.
Check			256lb

AVERAGE	Early Application	Late Application
Cyanamid	292.3lb, 39 bu. per A.	292.5lb, 39 bu. per A.
Ammonium Nitrate	315 lb, 42.1 bu. per A.	341 lb, 45.5 bu. per A.

Average all Applications—

Cyanamid	292.3lb, 38.9 bu. per A.
Ammonium Nitrate	330.8lb, 44.1 bu. per A.
Check	250 lb, 33.3 bu per A.

*Some of the corn was stolen in this plot and it was not included in the average.

In the experiments made at the College Station with commercial fertilizers under corn, nothing has proven profitable except ones carrying nitrogen, and with these the margin of profit has not been great. Tables 8, 9, and 10 give data on experiments carried on in 1919 and 1920. For corn land low in nitrogen, an application of 100 pounds of nitrate of soda per care is recommended. This should be applied as a side dressing when the corn is about knee high.

TABLE 9.—NITROGEN FERTILIZERS UNDER CORN—COLLEGE STATION, 1920.

Plat No.	VARIETIES	Plat yield	Acre yield in bu.	Gain over nearest check	Av. gain from 100lb	Av. gain 200lb
1	Cyanamid, 100lb per A.	101.0lb	57.9	10.1 bu.	9.3 bu.	
2	Ammonium Nit., 100lb per A.	107.5lb	61.6	13.8 bu.	14.2 bu.	
3	Check	83.5lb	47.8	bu.	bu.	
4	Nitrate of Soda, 100lb per A.	94.0lb	53.8	6.0 bu.	10.6 bu.	
5	Cyanamid, 100lb per A.	73.0lb	41.8	8.6 bu.	bu.	
6	Check	58.0lb	33.2	bu.	bu.	
7	Ammonium Nit., 100lb per A.	83.5lb	47.8	14.6 bu.	bu.	
8	Nitrate of Soda, 100lb per A.	83.0lb	47.5	15.2 bu.	bu.	
9	Check	39.0lb	22.3	bu.	bu.	
10	Cyanamid, 200lb per A.	56.0lb	31.9	9.6 bu.	bu.	6.9bu
11	Ammonium Nit., 200lb per A.	79.0lb	45.2	14.3 bu.	bu.	14.4bu
12	Check	54.0lb	30.9	bu.	bu.	
13	Nitrate of Soda, 200lb per A.	94.5lb	54.1	13.2 bu.	bu.	15.2bu
14	Cyanamid, 200lb per A.	73.0lb	41.8	4.3 bu.	bu.	
15	Check	65.5lb	37.5	bu.	bu.	
16	Ammonium Nitrate	91.0lb	52.1	14.6 bu.	bu.	
17	Nitrate of Soda	99.0lb	56.7	17.2 bu.	bu.	
18	Check	69.0lb	39.5	bu.	bu.	

Six row plats, but only the four middle ones weighed. 1-39 Acre in each plat weighed. Corn, knee to waist high.

TABLE No. 10.—NITRATE OF SODA UNDER CORN—COLLEGE STATION, 1920.

Nitrate applied at rate of 200 pounds per acre, corn half knee high to nearly waist high, being badly stunted in spots and yellow due to wet weather. One-fourth acre plats.

Plat Number	VARIETIES	Wts. Ser. 4 No treatment.	Ser. 3—200lb Nitrate.	Ser. 2—No treatment.	Ser. 1—200lb Nitrate.
1	Simmons	39.0	37.5	42.0	46.5
2	Jones	42.0	46.5	42.5	49.0
3	Cocke's Prolific	46.5	44.0	47.0	56.0
4	Gerrick	38.5	44.0	42.0	62.0
5	Hastings	44.5	41.0	45.5	56.5
6	N. C. Prolific	34.5	28.5	33.5	40.5
7	Vardaman	36.5	35.5	40.5	42.5
8	Station Mosby	37.5	33.5	37.0	43.5
9	Mosby (Ewing)	38.5	45.5	46.0	56.0
10	Mosby-553	42.0	41.5	42.0	57.0
11	Mosby (Woodruff)	36.0	46.5	37.5	45.0
12	Marlboro (Coker)	34.0	50.0	40.0	51.5
13	Marlboro (Wann)	45.0	46.0	37.5	55.0
14	Station Paymaster	37.0	51.0	40.0	46.5
15	Paymaster (Harp)	37.7	59.0	41.5	61.5
16	Sta. Tenn. Red Cob	36.0	50.0	31.5	55.5
17	T. R. Cob.-72	41.0	47.5	46.0	60.5
18	Florida Flint	34.0	55.5	33.0	48.0
19	John. Co. White	27.0	43.5	32.0	40.0
20	Cham. Early Wh. Dent	34.0	47.5	37.0	31.0
	Totals	761.2	894.0	794.0	1004.0
		44.8 bu. per A.	52.6 bu. per A.	46.7 bu. per A.	59.1 bu. per A.

Average yield of checks, 45.7 bushels per acre.
Average yield of treated plats, 55.8 bushels per acre.
Gain due to treatment, 10.1 bushels per acre.
Cost of fertilizer, $8.00 per acre.
Net gain (valuing corn at $1.00 per bushel), $2.00 per acre.

Rotations. Cropping land in corn continuously is not a good practice. Insect and fungus diseases will be less troublesome, yields will be better, and the general fertility of the soil can be maintained more easily if a good system of rotation is followed. The crops put into the rotation are determined largely by the type of farming followed. For diversified farming, a three-year rotation consisting of corn with cowpeas sown in the middles at the last cultivation, oats and vetch followed by cowpeas, and cotton the third year gives good results. A dairy farmer will probably prefer to shorten rotation to two years, leaving out the cotton and growing corn every other year. A cotton farmer will prefer to lengthen the rotation to four years and grow cotton two years in succession.

Soils Adapted to Corn. The best soil for corn is well drained, rich, sandy loam which contains a fair amount of humus. Most of the valley soils in the area covered by this bulletin can be made to produce good corn and the black Houston clay soils of the Northeast Prairie as well. Growing corn for grain on the thin hill lands of Central Mississippi and in the Flat Woods belt is seldom profitable.

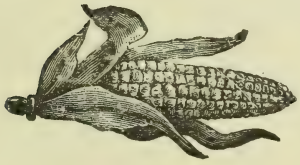
Source of Seed. Below is a list of the parties from whom the seed used in the variety tests in 1920 was obtained:

Champion Early White Dent	Harpeth Valley Seed Co., Franklin, Tenn.
Cocke's Prolific	Mississippi Experiment Station
Florida Flint	Mississippi Experiment Station
Goliad	Mississippi Experiment Station
Gerrick	Mississippi Experiment Station
Hastings	Hastings Seed Co., Atlanta, Ga.
Jones' Prolific	Mississippi Experiment Station
Johnson County White	Mississippi Experiment Station
Laguna	Mississippi Experiment Station
Mosby (Station)	Mississippi Experiment Station
Mosby-553	Mississippi Experiment Station
Mosby (Ewing)	E. C. Ewing, Scott, Miss.
Mosby (Wodruff)	A. S. Woodruff, Batesville, Miss.
Marlboro (Wannamaker)	W. W. Wannamaker Seed Co., St. Mathews, S. C.
Mexican June	R. K. and F. L. Weir, Starkville, Miss.
Marlboro (Coker)	Pedigreed Seed Co., Hartsville, S. C.
North Carolina Prolific	Tucker-Mosby Seed Co., Memphis, Tenn.
Paymaster (Station)	Mississippi Experiment Station
Paymaster (Harpeth)	Harpeth Valley Seed Co., Franklin, Tenn.
Simmons' Prolific	Harlow Simmons, Warnerton, La.
Tennessee Red Cob (Station)	Mississippi Experiment Station
Tennessee Red Cob-72	Mississippi Experiment Station
Vardaman	Mississippi Experiment Station

BULLETIN No. 198 JANUARY, 1921

CORN VARIETY TESTS 1913 to 1920

DELTA BRANCH STATION
W. E. AYRES



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CORN VARIETY TESTS, 1913-1920

DELTA BRANCH STATION

W. E. AYRES

Since 1913 from 8 to 23 varieties and strains of corn have been tested at the Delta Station each year. The tests have been made on loam soil. In the majority of years the tests have been planted late in March or early in April and ordinary cultivation given. Fairly good yields have been secured without the use of fertilizer in any form.

Results of one or two years are often misleading since weather conditions have much to do with yields. A variety may yield well one year and very poorly the next. Varieties which never lead in tests may, by consistently ranking high (second or third), produce higher average yields than those which fluctuate from good to poor. The consistent yielders are certainly more desirable. No variety has ever been found by any investigator which always produces best. There are, however, a few standard varieties which have consistently yielded well since 1913. The prolific varieties have given better results than the one ear sorts.

Table I shows average results of the tests conducted. Cocke Prolific has given better results, one year with another, than any other variety tested for more than three years. Mosby from E. C. Ewing, of the Delta Pine Lands Corporation, of Scott, Miss., has been tested two years and has produced better than Cocke Prolific in both 1919 and 1920. No other variety has yielded as well during the entire period tested. It will be noted that only three varieties, Cocke Prolific, Delta Mosby (Mosby grown by Delta Station, except 1919 and 1920 in which tests Ewing Mosby was used), and Vardaman, have been tested every year since 1913. During the period, Cocke Prolific has produced an average of 3.7 bu. per acre more annually than Delta Mosby and 2.5 bushels more than Vardaman. Vardaman has averaged 1.4 bu. per acre more than Delta Mosby for the eight years. Ewing Mosby produced an average of 4.7 bu. per acre more than Vardaman in 1919 and 1920, and 0.7 bu. more than Cocke Prolific. Woodruff Mosby produced 1.7 bu. per acre more than Vardaman in three tests, and 2.6 bu. less than Cocke Prolific. Station Paymaster has produced 1.7 bu. more than Vardaman in two tests, but less than either Cocke Prolific or Ewing Mosby. With exceptions Delta Mosby, Vardaman, and Cocke Prolific have all been better average yielders than other varieties tested. Paymaster is very soft and contains much damaged corn. During the last four years Hastings' Prolific has been a very consistent yielder. It has not been lower than fourth in the tests and has lacked only a half bushel of averaging as much as Vardaman.

Hickory King has been the poorest yielder tested for more than two years. It produced 15.4 bu. less annually than Cocke Prolific during the three years it was tested. Cocke Prolific has produced an average of more than 7 bu. per acre more annually than Florida Flint, Marlboro, North Carolina Prolific, Silver Mine, and Tennessee Red Cob. However, Silver Mine (Iowa) is probably the best very early corn.

Table II gives yields of the fifteen varieties, which are of most interest, for every year they have been tested. Detailed reports of all tests previous to 1918 have been published in a circular which is now out of print. Reports for 1918, 1919 and 1920 are given in this publication. Study of these detailed reports reveals that Cocke Prolific has ranked 1st., 4 years; 2d., 2 years; and 3d., two of the eight years tested. It is the only variety tested more than 1 year which has never stood below 3d. place. Florida Flint has been tested three years and has ranked 12th, 9th, and 11th. Hickory King has stood at the foot of the list twice out of three tests and near the bottom in the other test. Jones Prolific has ranked 4th, 1st, 4th, 16th, and 5th. It has not been a consistent producer. The same may be said of Marlboro. The two Mosby strains shown in the table have never taken a very low rank and have yielded consistently. Ewing Mosby is probably better than Cocke Prolific. North Carolina Prolific shows no merit for Delta conditions. Paymaster yields fairly well but, as previously stated, is soft and easily damaged in the field. In the 1920 test more than 25% was badly damaged. Iowa Silver has stood near the bottom in all tests and should be considered only as a very early corn to be used before other corns mature. Simmons Prolific has ranked 14th and 8th. Tennessee Red Cob has ranked 6th., 3 years; 10th, 2 years; and 18th, 1 year. It has been a fair yielder but is nearly as soft and easily damaged as Paymaster. Vardaman has been a consistent yielder and has averaged better than Mosby during the eight years. However, in both 1919 and 1920 it has not done as well as in previous years.

The data at hand indicate that Ewing Mosby, Cocke Prolific, Hastings' Prolific, Woodruff Mosby, and Vardaman are the safest corns for Delta farmers to plant.

THE 1920 EXPERIMENT

This experiment was made on a typical Delta (Deer Creek) soil. On May 28th six series of one-row plats were planted on loam soil which had been well prepared previously. The rows were three feet and the plants were left three feet apart in the drill. On July 2d five series of plats were planted on soil which is sort of a "medium" between loam and "buckshot". Both tests were given ordinary cultivation until just before tasselling.

At harvesting time the product of each variety was separated into sound and damaged ears. Table III shows total yields, yields of sound grain, total values and per cent grain of husked ears of each variety. Yield data are based on an average stand but the stand was not bad in any case.

In the test planted May 28, Cocke Prolific, Ewing Mosby, Hastings Prolific, Jones Prolific, and Woodruff Mosby led in value of grain. In total yield of grain Ewing Mosby, Cocke Prolific, Hastings Prolific, Woodruff Mosby, and Jones Prolific were the leading varieties in the order named. The poorest varieties, from the standpoint of value of grain, were Hickory King, Johnson County White, North Carolina Prolific, Station Mosby, and Mosby 553.

In the test planted July 2d, Ewing Mosby, Tennessee Red Cob, Harpeth Paymaster, Simmons Prolific, and Cocke Prolific were the most paying varieties. Ewing Mosby was second in total yield of grain but it and some of the other prolific varieties were more valuable because of the relatively small amount of damaged grain produced.

The showing made by the prolific varieties prompted a study of the relation between value of grain and prolificacy. Cocke Prolific, Hastings Prolific, Simmons Prolific, Jones Prolific, Ewing Mosby, and Woodruff Mosby were the most prolific. These were the six varieties producing the highest values in the test planted May 28th, though not in same order. Johnson County White, Hickory King, Tennessee Red Cob, Station Mosby, and North Carolina Prolific were the least prolific. Four of the latter occupy places at the bottom of the list of values. Even in the late-planted test the prolific varieties have made good. The great variation in yield of different strains of Mosby may be due to a difference in prolificacy.

As an average of both tests, Simmons Prolific, Jones Prolific, Station Mosby, Cocke Prolific, and Jones x Vardaman showed the lowest percentage of damaged corn and Johnson County White, Harpeth Paymaster, Station Paymaster, Woodruff Mosby and Tennessee Red Cob showed the highest percentage.

Hickory King, Florida Flint, Johnson County White, Paymaster, and Simmons Prolific are the earliest varieties tested. Marlboro and Mosby, Tennessee Red Cobb, Hastings Prolific, Vardaman, and Cocke Prolific are the latest in the order named.

THE 1918 EXPERIMENT

By accident the seed of all but eight varieties became mixed in 1918. The test was made on loam soil of medium fertility. Ordinary cultivation was given. Cocke Prolific, Vardaman, Marlboro, and Hastings Prolific were the highest yielders in the order named.

THE 1919 EXPERIMENT

Soil and cultural conditions were the same in this test as in 1918 and 1920. Ten series of plats were planted. Average yields are given. Ewing Mosby, Station Paymaster, Delta Station Cocke Prolific, Hastings Prolific, and Vardaman were the highest yielders in the order named. Selection No. 206, Marlboro, Tennessee Red Cob, North Carolina Prolific, and Jones Prolific made the poorest showing. The best five outyielded the poorest five 10.4 bushels per acre, of 46%. Such an increase due to varietal difference alone is certainly worth considering. Better varieties will make Delta corn growing more profitable.

TABLE I.—YIELDS OF STANDARD VARIETIES FOR YEARS TESTED

Compared With Average of Other Varieties for the Same Years.

VARIETY	No. of Years Tested	Average Yield	AV. YIELD OTHER VARIETIES IN SAME TESTS.		
			Cocke Prolific	Delta Mosby	Vardaman
Cocke Prolific	8	40.9	Same	37.2	38.4
Florida Flint	3	34.2	41.3	39.1	37.7
Hastings Prolific	7	36.1	41.6	37.8	37.8
Hickory King	3	27.3	42.7	39.6	40.5
Jones Prolific	5	36.3	38.6	36.9	37.3
Marlboro	5	35.4	43.3	39.4	39.0
Mosby-Delta	8	37.2	40.9	Same	38.4
Mosby-Ewing	2	41.9	41.2	Same	37.2
Mosby-Woodruff	3	38.2	40.8	40.9	36.5
N. C. Prolific	4	30.6	40.3	38.2	38.0
Paymaster-Harpeth	2	37.6	41.2	41.9	37.2
Paymaster-Station	2	38.9	41.2	41.9	37.2
Silver Mine	4	31.7	44.8	38.9	42.0
Simmons Prolific	2	34.5	41.2	41.9	37.2
Tenn. Red Cob	6	33.9	41.4	38.1	38.3
Vardaman	8	38.4	40.9	37.2	Same

TABLE II.—YIELDS IN BUSHELS PER ACRE OF STANDARD VARIETIES FOR ALL YEARS TESTED

VARIETY	YEARS TESTED							
	1913	1914	1915	1916	1917	1918	1919	1920
Cocke Prolific	42.5	32.0	36.3	40.1	60.3	33.8	33.0	49.3
Florida Flint	32.8	28.0						41.7
Hastings Prolific	31.1	31.5		32.4	51.0	27.0	32.4	47.0
Hickory King	25.0		23.6					33.4
Jones Prolific	38.7	37.7	34.6				25.0	45.7
Marlboro				38.0	47.1	28.8	21.8	40.8
Mosby-Delta	35.7	31.8	33.2	39.1	47.6	26.6	33.8	49.9
Mosby-Woodruff				37.5			30.8	46.4
N. C. Prolific	36.9		25.7				22.4	37.3
Paymaster-Harpeth							30.8	44.3
Paymaster-Station							33.7	44.1
Silver Mine	24.7		31.7	31.1	39.3			
Simmons Prolific							25.6	43.3
Tennessee Red Cob		27.2		37.0	48.9	26.0	22.0	42.4
Vardaman	35.1	34.6	42.5	35.3	55.0	30.5	31.0	43.3

TABLE III.—THE 1920 EXPERIMENT

VARIETY	BUSHELS PER ACRE				TOTAL VALUES (1)				Per Cent Grain (2)
	May 28 Planting		July 2 Planting		May 28 Planting		July 2 Planting		
	Total Yield	Sound Grain	Yield Total	Sound Grain	Dollars per A.	Rank	Dollars per A.	Rank	
Simmons Prolific	43.3	39.4	31.5	29.7	42.13	6	30.96	4	84.4
Jones Prolific	45.7	41.6	28.3	26.2	44.47	4	27.67	9	84.8
Cocke Prolific	49.3	45.5	31.6	27.9	48.16	1	30.49	5	83.6
Jones x Vardaman	39.9	36.5	27.4	23.6	38.88	12	26.26	13	85.7
Hastings Prolific	47.0	42.1	29.7	25.3	45.53	3	28.38	8	86.2
North C. Prolific	37.3	30.7	24.0	21.3	35.32	16	23.19	18	88.4
Vardaman	43.3	38.0	30.5	26.7	41.71	7	29.36	7	87.3
Station Mosby	39.4	35.9	27.4	24.4	38.35	15	26.50	12	85.7
Ewing Mosby	49.9	43.8	34.6	30.2	48.07	2	33.28	1	86.5
Mosby 553	39.8	36.2	28.3	23.7	38.72	14	26.92	10	85.4
Woodruff Mosby	46.4	37.7	28.5	22.7	43.79	5	26.76	11	90.2
Marlboro	40.8	34.2	24.7	21.0	38.82	13	23.59	17	80.8
Station Paymaster	44.1	30.9	32.2	26.2	40.14	9	30.40	6	83.6
Harpeth Paymaster	44.3	28.9	34.2	27.2	39.68	11	32.10	3	83.8
Sta. Tenn. Red Cob	42.4	36.1	34.9	27.8	40.51	8	32.77	2	82.4
Florida Flint	41.7	35.9	26.6	22.8	39.96	10	25.46	16	85.4
Hickory King	33.4	25.2	27.3	23.6	30.94	18	26.19	14	84.9
Johnson Co. White	37.0	22.7	28.2	21.0	32.71	17	26.04	15	80.5

(1.) In computing values sound corn was considered worth $1.00 per bushel and damaged 70 cents.

(2.) Based on husked ears.

TABLE IV.—THE 1918 and 1919 EXPERIMENTS

VARIETY	1919			1918	
	Rank	Bu. per A.	% Grain	Rank	Bu. per A.
McCorkle				8	22.2
Mosby-Ewing	1	33.8	89.6		
Paymaster-Station	2	33.7	81.2		
Cocke Prolific, Delta Station	3	33.0	84.0	1	33.8
Hastings Prolific	4	32.4	87.0	4	27.0
Vardaman	5	31.0	84.7	2	30.5
Paymaster-Harpeth	6	30.8	78.5		
Mosby-Woodruff	7	30.8	88.3		
Mosby 773	8	29.4	81.3		
Cocke Prolific-Allen	9	29.0	84.0		
Ala. Station Yellow	10	28.8	82.5		
Cocke Prolific-Station	11	28.4	83.7		
Surcropper	12	28.2	80.0		
Jones x Vardaman	13	26.6	83.5		
Simmons Prolific	14	25.6	83.2		
Mosby-Rhodes	15	25.6	82.2		
Jones Prolific	16	25.0	82.8		
North Carolina Prolific	17	22.4	81.0		
Tennessee Red Cob	18	22.0	81.5	6	26.0
Marlboro	19	21.8	84.0	3	28.8
Selection 206	20	20.8	66.6		
Mosby-Delta Station				5	26.6
New Era				7	24.0

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SUGARCANE FOR SYRUP MAKING

By

E. B. FERRIS

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MISSISSIPPI AGRICULTURAL EXPERIMENT STATION

Agricultural College, Mississippi

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SUGAR CANE FOR SYRUP MAKING

E. B. FERRIS.

Introduction.—For about seven years after this station was located at McNeill a lot of work was done with sugar cane and considerable money was spent in building and equipping a syrup plant in which to manufacture the cane grown on the station, together with that grown in the neighborhood, into a first class syrup, with the hope that the industry might be stimulated and information obtained not only on the growing of the cane but on the making and marketing of the syrup. To carry on this work required a considerable outlay of money, for in order to run the plant most economically some fifty acres of cane would have been required. To grow so much cane ourselves or to have manufactured it into syrup if grown largely by others would have required a considerable outlay of money, for it is an expensive crop both to grow and put into marketable condition.

At the time the work was started and for several years thereafter our station retained its sales fund and so long as any crop paid its own way we could afford to grow it in any quantity. While this work was at its best, the Legislature passed a law requiring money derived from the sale of farm products returned into the State treasury and this made it impossible to continue work of this kind without a considerably larger appropriation for maintenance than this or succeeding Legislatures would give and so our work with sugar cane had to be abandoned.

This was not done, however, until after a lot of information was obtained about the growing of the cane and the making and marketing of the syrup and this information was embodied in a bulletin on the subject issued in 1909 which has since become exhausted. As there continues to be considerable demand for such information as it contained it has been thought best to rewrite it, bringing it as nearly up to date as possible and embodying in the new edition any information of value obtained since it was written.

Soils suited to sugar cane.—Sugar cane is a gross feeder and requires a soil not only well filled with available plant food, but also one with sufficient humus to hold a large supply of water to tide it over any droughts that may occur. Dr. W. C. Stubbs, the well known authority on sugar cane, figures that a yield of 45 tons of cane to the acre will require a 56 inch rainfall and it would be a very exceptional season when water for a crop even one-third as large would be so well distributed by rains as to meet

the requirement without the aid of vegetable matter in the soil to hold some of this rainfall in reserve for periods when it would not be supplied by rain.

Cane, therefore, should be planted only on the best lands, well filled with decaying vegetable matter, preferably well drained bottom lands. In this latitude two crops are nearly always grown from one planting, often three, and it is only the best soils that will give economical yields under such a strain. The man who would attempt here to grow sugar cane on all his land, or so large a part of it as is so frequently planted to corn or cotton would soon be growing it at a loss. It is for this reason that it should continue to be grown as it has been grown in the past, in small quantities to each farm by a large number of small farmers. In this way it is doubtless the best paying crop that can be planted here and only one thing prevents its being developed in far greater proportions than it is and this is a lack of uniformity in the syrup made from it and the effect this has on the sale of the syrup. The sandy loam soils of the Coastal Plains region of this state are ideal for growing a superior quality of sugar cane syrup, better in color, clearness and flavor than that grown on the heavier lands of this and other states. This is doubtless due to the fact that cane on our light lands comes nearer reaching maturity in a growing season and there are consequently fewer immature joints on each stalk to be ground and made into syrup.

History.—Sugar cane belongs to the large family of grasses and is said first to have been grown in China and India. It was introduced into this country by the planters around New Orleans and is now extensively grown in Louisiana for making both syrup and sugar. It does not form seed in this climate but in countries further south, even in middle and southern Florida, some varieties throw out seed stems when from twelve to thirteen months old and reach maturity some three months later. However, the seeds from sugar cane germinate very poorly and it has been only in recent years that they have been used at all as a means of propagation and even now they are only used for introducing new varieties. In this and in all tropical countries, even, cane is propagated commercially by planting the stalks. A sugar cane stalk is made up of a series of nodes and internodes and at each node or joint is a bud which sprouts and forms a stalk. These stalks sucker or tiller freely so that from every original plant from three to ten stalks should be found at the harvest and in tropical countries many more than this.

Saving seed cane.—Seed cane should be allowed to grow as late as possible in the fall consistent with danger from frost. It matures faster and better as the season advances and if cut and banked while the weather is yet warm is more apt to heat and spoil as a consequence. If cut and not covered at once with soil, it is apt to dry out and become injured in this way. Too, if cut early the stubbles are apt to sprout and the young plants be killed by the first frost. In the latitude of Poplarville we seldom have

a frost that will injure the buds before the tenth of November and often not until later. While many reasons may be advanced for saving seed from the immature parts of the cane stalk, that is, the upper part, our experience has been that best results are to be had from planting the whole stalk. As the joints are shorter in cane grown from stubble than in plant cane, more plants are to be had from a given length as well as less juice, if used for syrup. Therefore it is well to save seed cane from the oldest stubble and in saving this seed cane, if ground is not to be used for a succeeding crop of cane, it is best to take up these seed canes by the roots as by so doing the canes keep better thru the winter while the buds near or beneath the surface of the ground are much closer than they are higher on the stalk. Seed cane is saved by windrowing near where it is cut, by putting in a regular seed bed, or by planting at once where it is to be grown the succeeding year. Where it can be done we very much prefer fall planting of cane for it saves a lot of work and if cane is bedded and planting done in the spring it frequently sprouts thru the winter and these sprouts are broken in rehandling. Whether planted when cut in the fall or bedded for planting in the spring much care should be taken against letting the stalks dry and by either method the canes should be quickly covered with moist earth so as to prevent evaporation.

For fall planting the ground should be thoroughly prepared and rows opened 4½ or 5 feet apart with middle burster or with two furrows from an ordinary turn plow, the seed cane should be dropped in this furrow and covered immediately with three or four inches of soil. If the weather is dry a heavy roller should follow the covering of the cane to bring moisture to it and prevent "dry rot." Where the natural drainage is good as is the case on the hill lands of this section flat preparation and planting is to be preferred. On poorly drained soils it is best in the case of fall planting to throw up beds wide enough for two rows of cane so as to give better drainage, for if the land becomes water sogged "wet rot" will prove equally as bad on the seed cane as is the "dry rot" caused by a lack of moisture.

Where planting is to be done in the spring the seed cane should be cut in the fall if the same ground is to be used the following year to grow cane from the stubbles, if not, it should be dug or plowed up, and in either case should at once be piled shingle fashion between the old cane rows or hauled to the seed bed and covered promptly with soil using turn plows to do the covering and following these with shovels to complete the job. It is best to do this while the weather is damp or else to pour water over the windrowed cane. Prompt covering with dirt keeps out the air, prevents the drying of the cane, and will save much loss from dry rot.

Quantity of seed required to plant an acre.—A question frequently asked is the quantity of seed required to plant an acre. We will assume that standard rows will be five feet apart as this is a good distance for placing them. This would give 42 rows each 210 feet long to the acre and would require 8820 feet of cane. Assuming that each stalk would be four feet long, it would require 2205 stalks, or if we doubled them in the drill

4410 stalks. Each of these stalks will weigh about two pounds giving a total of about four and one-half tons to plant an acre. On land thoroughly prepared and carefully planted in the fall we feel sure that a good stand could be obtained by half lapping the cane in the drills, tops over butts, and using about 3500 stalks to the acre. This is especially true if care is taken in the spring to remove surplus dirt from the cane drill by barring off with turn plows and allowing the sprouts every opportunity to come through promptly.

Should the stalks be cut?—In planting these seed stalks it is generally thought that they should be cut in small pieces, the popular impression being that if not cut the buds that sprout first will draw the strength from those that sprout later and prevent them coming out at all. This is not true according to the results of the Louisiana Experiment Station which results seem to have been borne out by our experience at McNeill. Each eye or bud on the stalk is independent of the other and the cutting of the cane, especially in fall planting, only serves to induce fermentation and consequent decay. If the seed stalks are straight (which is seldom the case) it is best not to cut them at all, but if they are crooked they should be cut in two or more pieces so as to make them lie flat in the furrow and lessen the danger of pulling them up in cultivation or of covering a part of the stalk too deep and another part too shallow.

What part of the stalk to plant.—In ordinary farm practice the entire stalk of cane is planted and in a recent interview with one of our best growers he stressed the point that the best and heaviest stalks for seed gave most satisfactory results in the subsequent crop. The young plant draws its subsistence from the mother cane until an independent root system can be developed to where it can draw its support from the soil. It would appear, therefore, that large stalks for cane would be as necessary as large seed pieces in planting Irish potatoes with this difference that the cane has a much longer growing season and could better overcome a handicap in its very early life.

Some people advocate the planting of the upper part of the cane for seed and the use of the lower part for syrup. This would undoubtedly effect a considerable saving if the cane obtained therefrom were as good as that from the whole stalk and the labor of thus handling were not too great. The upper part of the stalk has much less sugar than the lower and is therefore less valuable for syrup and if as many as five or six joints of mature cane are left with the tops these may be used successfully in getting stands of cane. If only two joints of mature cane are left with the tops, as was advocated for a time by some agriculturists, our experience has been that poor results will follow and taking every thing into consideration we doubt the advisability of trying to use the less mature parts of the cane for seed. We would advise always the use of cane from stubble fields which is less valuable for juice and more valuable for seed by reason of the joints being closer.

Varieties.—In recent years a number of varieties of cane have been brought to Louisiana from all over the sugar growing world by the Louisiana Sugar Experiment Station located at New Orleans. They were kind enough at one time to send us a number of these varieties in small quantities which we planted and grew with poor success. Only two of the many sent sprouted or gave any promise of success with us. These two were D74 and D95 from which we grew sufficient cane to plant in fairly large quantities. At the end of a period of years, however, neither seemed so well adapted to the section as the common kinds already in the country and these finally disappeared. The red or purple cane is the one most commonly grown here with ribbon and white following in the order named. This red cane being harder than either of the other kinds will withstand more hardships and is the one that will finally predominate under average conditions. Tests here comparing this purple cane with the ribbon cane have not shown any material difference in yields. The ribbon and white canes, being softer, are more desirable for chewing and there being less coloring matter in the outer covering they give a brighter syrup. Japanese cane is the hardiest of all the varieties tried and can be grown much farther north than the other kinds, but it is not so good for syrup, the stalks being smaller and more woody, making it more expensive to handle from field to mill, harder to grind, with a smaller percentage of juice and this containing less saccharine matter. In tests made at our syrup plant comparing Japanese and purple cane, we got a 72% extraction from the purple cane, only 60% from the Japanese while the juice from the latter had from 15% to 25% less saccharine matter than the former.

Japanese cane is valuable as a forage crop and may be cut before and after frost falls and fed from wagon or ricks to all kinds of livestock, all devouring it greedily. It may also be taken from the field without stripping or topping, run thru a cane mill and the greater part of the juice expressed, then the bagasse may be put in ricks to which animals have access thru the winter. Mr. H. M. Holcomb, recently from North Alabama but now of Carriere, Miss. has had some interesting experience with Japanese cane as a combination syrup and forage producer. In 1919 he run this cane before frost thru a mill without stripping or topping, making syrup of the juice and piling the bagasse in a rick made of pine poles and so constructed as to allow cattle or horses to go under it for shelter and at the same time eat it from the under or outer side. He found that in cutting before frost it did not make as good syrup and that the bagasse with the green leaves and tops fermented quickly and did not keep well in the rick. The 1920 crop he allowed to stand in the field until after Christmas when the cold had killed the tops and leaves, then run it thru the mill and put bagasse in rick. The syrup was much better and there was no tendency for the bagasse to sour while animals ate it well and dry cattle were wintering on it with what additional feed they got on the range.

Fertilizers.—Seed cane should have a light application of fertilizer at the time it is planted for the reason that around the joints the mother cane puts forth roots long before the plants appear above ground and if these roots are promtply fed the young plants will grow off much more vigorously. Aside from this, it is best to apply the bulk of the fertilizer to both plant and stubble cane in the spring after the stand is about completed and the dirt ready to be thrown back to the cane rows. This fertilizer should be applied on both sides and also scattered across the cane rows. A number of tests have been conducted at this station to show the effects of different plant food materials on the yields of cane, also to show the effect of one or more applications of a given fertilizer. These tests while not altogether conclusive lead us to advise under average conditions making a single application of the fertilizer in the spring and not a part then and the balance later. This does not have reference to the small quantity that should be put under the cane before planting to give it a more vigorous start.

On the whole our results have shown no material increase in yield due to the addition of potash to a mixture of nitrogen and phosphorus. At least this is true where cotton seed or cotton seed meal have been used as a source of this nitrogen. In fact, except in regular test plats, we used no potash under cane grown under field cultivation and one year averaged twenty tons of cane per acre from a field of twelve acres, while on a small part of this field, fertilized the year before with cotton seed and acid phosphate and grown to cabbage, we made over fifty tons of cane per acre. In cases where potash is known to increase the yields of sugar cane it should, of course, be used but where growers are not convinced of its need we believe it safe to leave it off until actual results show the want of it.

On good land well filled with vegetable matter sugar cane will ordinarily give profitable returns from the use of one thousand pounds or more of commercial fertilizer and this under prevailing prices of cotton seed meal may conveniently be made at home by mixing equal parts of cotton seed meal and acid phosphate. Sugar cane belongs to the family of grasses and all such crops require fertilizers rich in nitrogen. Many practical growers consider cotton seed meal alone as one of the best fertilizers for cane and with this commodity selling so low as at present we would be inclined to use it in preference to other carriers of nitrogen even to using two parts of the meal to one part of acid phosphate. Sugar cane is an extremely hard crop on the land and should always be planted on the best soils following a leguminous crop of some kind. On such soils, if nitrogen as compared to phosphorus, is relatively high, a mixture of two parts acid phosphate to one of cotton seed meal will give good results the first year, but if the land is kept to cane more than one year the proportion of nitrogen to phosphorus should be gradually increased.

Cotton seed meal is so valuable as a feed that economic conditions ought to place such a premium on it that it could not be used as a fertilizer except indirectly but such is not the case at present and so long as these conditions remain unchanged we regard cotton seed meal as the best nitrogen carrier for any crop, more especially sugar cane for many of the best growers think it has a decided influence on the quality of syrup made from such cane and we are much of this opinion ourselves, though with no proof with which to base the statement. If the nitrogen in cotton seed meal goes very much higher than in its other carriers these may be substituted for the meal, but few of them make mechanical mixtures with acid phosphate that can so easily be distributed or handled with as little discomfort to the ones applying it.

The following table gives the results of two years work with fertilizers under sugar cane as conducted at McNeill:

RESULTS WITH FERTILIZERS UNDER SUGAR CANE

Plat No.	Area	Cot. Seed Meal Lbs. per A.	Acid Ph'sphate Lbs. per A.	Kainit, Lbs. per A.	Yld. per Plat Lbs.	Yield per A. Lbs.	Yield per A. Tons.	Yld. per A., in t'ns Stb'le cane	
1	.062A	210	208	90	3660	58,560	29.3	16.9	Purple Cane
2	.062A	210	208	90	3570	57,120	28.6	16.7	Ribbon Cane
3	.062A	210	454	90	4340	69,440	34.7	20.8	
4	.062A	420	416	180	4280	68,480	3.42	21.0	½ Applied in Spring & ½ in July
5	.062A	420	416	180	4400	70,400	35.2	20.4	
6	.062A	210	208	.....	3850	61,600	30.8	17.0	
7	.062A	105	104	49	4110	65,760	32.9	16.9	
8	.062A	838	832	358	4900	78,400	39.2	22.6	
9	.062A	.....	.....	.....	3830	61,280	30.6	16.8	
10	.062	420	162	61	4050	64,800	32.4	18.0	

Cultivation.—After the cane has been planted and is ready to sprout in the spring it is very important to remove all surplus dirt from above it so as to allow the young sprouts to come through. This is done by barring off the rows with turn plows and sometimes removing soil above the cane with hoes. The stubble cane should be treated pretty much the same way and the dirt removed from around the stubbles with hoes or pronged forks, or better by a stubble digger. Experience here has been that the stubbles will keep through the winter as well and possibly better by simply leaving them alone with no more dirt above them than would naturally accumulate in cultivation.

The Louisiana Experiment Station recommends the burning of all fodder and other trash accumulating from the harvest of sugar cane as early in the winter as possible so as to destroy insects likely to attack the cane the following year, but since this fodder and tops afford considerable protection for the stubbles against cold, and insect pests and diseases have been negligible here so far, we have preferred to leave this covering alone thruout the winter, burning it just before the cane is barred off in the spring.

If any considerable area of stubble cane is to be cultivated it will pay to buy a stubble digger, a two-horse implement made by B. F. Avery & Sons, which should be run over the stubble rows after they are barred off in the spring, loosening the dirt around them and reducing the cost over such work done with hoes in the same proportion that the mowing machine does over the scythe.

With proper care in early spring the sprouts from both stubble and plant cane will quickly show above the ground and the dirt should not be thrown back to them until sprouting has been about completed. It is then that the fertilizer is applied and the dirt returned to the row, after which cultivation should proceed as with other farm crops such as cotton or corn. Shallow cultivation is to be greatly preferred and for single horse work we have found nothing superior to the spring tooth cultivator which will drag over litter and trash buried in the middles where this has never been burned. Cultivation should be frequent enough to keep all weeds and grass killed as they appear above the ground and to conserve moisture to the extent that such conservation is necessary.

Harvesting.—In the fall or early winter, preferably after the first light frost has fallen, the blades must be stripped from the cane, the tops removed, and the stalk severed at the surface of the ground. It requires considerable cold to injure cane standing in the field, especially for syrup and in 1907 the thermometer went to 28 degrees on November 13 with a large part of our cane standing in the field. The buds on this cane blackened, the juice became a little frost bitten and we had great fear that it had been ruined. The temperature went to 32 degrees, and below, for three successive nights, the cane tops and leaves were largely killed, but when left standing all effects of the frost on the taste of the juice grew out of the cane and an excellent quality of syrup was made from it. Some of our best growers here leave a part of their cane in the fields until after Christ-

mas each year, beginning the making of syrup after the first frost and continuing it for weeks with practically no loss from cold.

The implement used almost universally for stripping cane is the ordinary cane or corn knife which is a piece of flat steel on a suitable handle and with a slight hook on the back end of the knife opposite the handle for stripping. In the Louisiana cane fields the cane is stripped by the downward strokes with the back of the knife, the third lick removes the top, and the fourth severs the stalk at the ground, the entire operation being completed as the workman proceeds.

Mr. Wm. Howse, a farmer of Cairo, Ga., has invented a simple cane stripper made of two pieces of thin steel about fifteen inches long by one inch wide and 1-16 inch thick, bent and flared at one end so as to slip over and fit around the stalk of cane, and at the opposite end securely bradded to a handle about three feet long. This stripper removes the blades with a single downward stroke and has been found to be a very useful implement. With this stripper the blades are removed by one set of laborers while others follow with knives and top and cut the cane. Much work has been done on the perfection of a cane harvester but with poor success on account of the extreme difficulty of handling crooked cane by machinery. It is seldom that a crop of cane can be grown to harvest without being blown and twisted by the wind into all sorts of shapes.

Yields of cane.—The yields of cane vary widely, of course, with the fertility of the land, cultivation, seasons, etc., but on reasonably good land here, properly fertilized, a yield of twenty tons of plant cane and fifteen tons of stubble cane may reasonably be expected, a ton of cane corresponding roughly to twenty gallons of syrup. In 1907 our station had at McNeill about twelve acres planted to sugar cane, a good portion of which was on hill land that was very rolling. On this entire acreage there was 1.1 acres of the Japanese cane which yielded 34.7 tons and made 537 gallons of syrup, or 15.5 gallons to the ton. The remaining 10.9 acres of purple cane made 224 tons which gave 4,236 gallons of syrup, or 1899 gallons per ton. In 1908 Japanese cane made only 13.7 gallons to the ton while purple cane made twenty two. In 1907 when we used sulphur, lime and "Clariphos" for bleaching and cleaning cane juices the syrup from Japanese cane was of good quality, but in 1908 when the use of these materials was discontinued the syrup from this Japanese cane had an extremely biting taste and would not sell in competition with that made from the purple cane made at the same time and in the same way.

On the choicest spots in the cane field above mentioned the yields ran up to above 800 gallons of syrup to the acre and on one plat of .43 of an acre we weighed 49,735 pounds of cane which made 470 gallons of syrup, or at the rate of 1092 gallons to the acre. This was on level hill land that had been fertilized with raw cotton seed, animal manures and acid phosphate in 1905, planted to cabbage and again fertilized in 1906 rather heavily. In the fall of 1906 purple cane was planted on this land in rows 4½ feet apart and in the spring of 1907 this cane was fertilized with equal parts

of cotton seed meal and acid phosphate at the rate of 500 pounds of each per acre. It is well to say that while this cane began sprouting soon after Christmas, these sprouts were never killed, a perfect stand was obtained very early in the spring and all conditions thruout the growing season were very favorable to the development of cane.

In this connection we would caution growers about the use of fresh animal manures under sugar cane. They will give an immense yield but have a tendency to give a salty, disagreeable flavor to the syrup. It is well to use manures on all land where they may be had, but these should be applied to cane lands at least a year before the cane is grown and this should follow a crop like peas or velvet beans at least partially turned into the soil so as to give it a better water holding capacity.

Handling cane.—Sugar cane is an extremely heavy crop and difficult to handle. It seldom remains erect until harvested, being nearly always blown by winds in summer, after which it grows in all sorts of shapes. When cut it is usually piled in heaps in every third row so that wagons may be driven through to pick it up. If loaded in an ordinary wagon body it is difficult to get to and troublesome to unload and in our section it is seldom grown in sufficient quantities to warrant the use of machinery for unloading, though if placed on ropes as it is loaded into the wagon body, simple hoisters may be improvised for lifting it out. In the absence of such a device or of carts or wagons that will dump the cane, the station has found a frame specially made for hauling silage corn or sorghum a most convenient method. This frame is recommended by the U. S. Department of Agriculture for use in hauling to silos and is made so as to be easily attached to the ordinary farm wagon.

Such a frame is made from 2 pieces of 2x6 18 feet long. With two U bolts fasten the ends of these under the hind axles so as to clear the wheels. Bring the opposite ends together, bevel, and belt or nail securely to a short piece of material sufficiently thick for boring a one inch auger hole and fasten under front axle with long king bolt. Four feet back of front axle nail or bolt a piece of 2x6 6 feet long across this main frame. Take two other pieces of 2x6 about ten feet long and bolt the ends of these to cross piece above mentioned so as to leave them about five feet apart, bevel the opposite ends of these two pieces and nail to outside of main frame about four feet from hind wheels. At a distance sufficiently great from both front and hind wheels to give them clearance nail pieces of 1x6 slanting over these wheels and cover space between wheels with boards one inch thick and about five feet long. The accompanying illustration will give a fair idea of the construction of this frame which any novice can build out of material that is easily obtained on any South Mississippi farm.

Such a frame has been used here for years with perfect satisfaction. It will hold a maximum load, the cane can be put on it with a minimum effort on the part of the laborer, it is easily got to for unloading and at least on short hauls will prove very valuable.

Syrup making.—The most of the cane made into syrup in this state is ground on three-roller horse mills that are seldom screwed up as closely as they should be and the percentage of juice extracted is usually far below the actual content of the cane. In examining several mills around the neighborhood the extraction was found to average below 60%, but the same mills by screwing up as closely as possible would give an extraction of 65% or more. The Experiment Station had a 3-roller mill of 6 h.p. capacity run by a steam engine and this gave an extraction of 72% or more. A 5-roller mill should give an extraction of more than 75%, so, as at present handled, a large part of the juice in the cane grown by the average small farmer is left in the bagasse and goes to waste.

The common method of making syrup by the average grower of cane is about as follows: the juice runs from the mill through the burlap bag into a barrel; from this it is usually removed in buckets or thru a pipe into another barrel elevated above one end of the evaporator; from this barrel it runs thru a faucet into the evaporator and as nearly as possible, the flow is so regulated as to have a constant stream of juice running in with a constant stream of syrup running out at the opposite end, in the proportion of about six parts of juice to one of syrup; while the juice is going the circuit of the evaporator it is being skimmed and cleaned and by the time it reaches the syrup stage, it is possible to have it fairly pure. An expert manipulator may make a fair quality of syrup in this way, but the average man will not clean the juice well and will either cook it too much when the syrup will go to sugar or too little when it will ferment. On such an outfit it is impossible even for an expert with a saccharometer to cook all the syrup to the same gravity and this ought to be the first and most important object in view.

A better quality of syrup may be made on just as simple an outfit as the one described by substituting a pan or kettle for the evaporator and by cooking a definite quantity of juice down to syrup, skimming thoroly, and finally testing the density of this syrup with a saccharometer that may be bought very cheaply or improvised at home. One of the most successful syrup makers in this county uses a pan that he made himself out of galvanized iron for the bottom and poplar boards for sides. This pan is three feet wide, fifteen inches deep and 7½ feet long, with a trough at one end for catching the skimmings. He cooks about 150 gallons of juice at the time and gets from 22 to 30 gallons of syrup from it. The cooking is done with wood and towards the end of the operation the fire is allowed to go down so that when the proper density is reached the syrup may be removed before its density can be materially increased. This party makes from 50 to 60 gallons of syrup a day on the one pan which is about the capacity of the ordinary evaporator. On the evaporator there is about an hour between the time the juice enters and comes out as syrup and on the pan described about five hours. In the one the evaporation takes place in shal-

low depths and in the other a large part of the boiling is done at depths of from 5 to 12 inches. Naturally less of the crystallizable sugar is converted into non-crystallizable in the first process than in the second so that syrup of the same gravity made on an evaporator is more likely to go to sugar than if cooked in a kettle or pan.

Mr. D. R. Johnson of McNeill is one of the largest as well as the most successful syrup makes in this section of the state. He grows considerable cane of his own and makes syrup for the public. He has a 3-roller mill weighing about 3500 pounds and made by the Mobile Pulley and Machine Works at Mobile, Ala. This mill is run by a 6 h.p. gasoline engine and is driven by a 6 inch belt. This mill has a capacity of 200 gallons of juice per hour. This juice runs from mill into a 200 gallon juice tank and from this tank is run by pipes and troughs into one or the other of two evaporators set on furnaces just below the mill so that it runs by gravity. These evaporators hold about 200 gallons of juice and are so arranged that when cooking is completed they may be lifted clear of the furnaces, tilted at the same time and the syrup drawn off from one end. When the cooking is completed and the syrup ready to draw a lever is pulled down and fastened and a sheet of iron placed over the furnace so as to cut off all heat. The 200 gallons of juice in each evaporator is cooked down to a density of 34 degrees as taken from the boiling syrup and usually makes 30 gallons of the finished product. From the evaporators this syrup is run thru cypress troughs and strained into a cypress tank from which it is drawn into cans or barrels. It requires about five hours to cook off a charge so that the capacity of the present plant is about 120 gallons per day and Mr. Johnson contemplates putting in two other evaporators in order to equalize his capacity for making juice.

Everything about the plant except the mill, engine and belt was made at home. The furnaces and chimneys to same are built of brick; the evaporators are made of 2x12 cypress boards nailed together and the bottoms are of sheet copper sufficiently wide and long to be turned up and nailed with copper nails to the sides of the evaporators. These evaporators are 38 inches wide, nine feet long and one foot high with 2x6 cypress boards beveled and flared and nailed to the top part of the sides so as to hold the juice when it boils and foams. The 1x6 boards are nailed to the sides of these evaporators, extending beyond the ends for about a foot and are notched so as to hold V shaped gutters into which the skimmings are drawn by means of a wide board nailed to the end of a handle of convenient length. From this trough the skimmings run into a barrel and thence to troughs in a nearby lot where they are fed to hogs. This operation gets rid of the bulk of the impurities in short order, subsequent cleaning being done with hand skimmers in the regular way. The one outstanding feature of this outfit is its simplicity and efficiency. It is built on the side of a hill, gravity moves all juice and syrup. It is largely home made and simple levers enable one man to lift the evaporator and contents clear of the furnace with little effort and the syrup made will neither sugar nor sour and has that quality which holds a customer once he is obtained.

Cooking by steam.—Really the best means of evaporating cane juice is by steam and if any considerable acreage is ever devoted to sugar cane in a given community, it will pay to have a community syrup factory or mixing plant just as we now have cotton gins and grist mills. These could be run in combination using the same boiler and engine to gin the cotton, grind the corn or cane, and evaporate the juice or mix the syrup. One of the bad features about the use of so much machinery for grinding and cooking syrup is that this machinery is idle the most of the year and pays nothing on the investment. In the boll weevil territory cotton ginning may always be completed before cane is ready to grind or syrup available for mixing and so the two might be run in conjunction. In many of the small towns in South Mississippi ice factories, cold storage plants for meat and dairy products, canneries for fruits and vegetables and at least mixing plants for syrup might easily be run as a single organization so as to keep most of the machinery and at least the expert labor busy thruout the year. Such a plant, run cooperatively, could cure the farmers' meat, cool his milk or cream for shipment to market, furnish ice for the towns and country, can the surplus fruits and vegetables and if not best suited for grinding the cane, could at least take the syrup as it comes from the many farms, mix, standardize, can and market this syrup.

The greatest trouble in extending the acreage of cane in South Mississippi is the lack of reliable markets. The home markets are already supplied and the individual growers have no time and little ability to open up new markets. If some dealer undertakes to buy up this syrup, he soon finds that he has about as many grades, possibly more grades, than he has farmers furnishing syrup and if by chance he should find a market he could never hold it for the reason that he could never guarantee to sell the same grade of syrup twice in succession. A better grade of syrup can be made by uniform handling from grinding the cane to canning the finished product, but experience has shown that the average farmer takes a pride in the quality of the syrup that he makes, cleans it fairly well, but falls down in standardizing his product. If all, or a part of the syrup made by the many individual growers could be brought to a central plant, mixed, reboiled and canned, it could be sold in competition with other standardized products under brand names. The trade will consume all the cane syrup we are likely able to furnish if it can be put up in the way the buyers demand.

Arrangement of syrup house.—While at McNeill this station built and equipped a complete syrup making plant designed and equipped by the Blymyer Iron Works Co. of Cincinnati, Ohio. The machinery in this plant cost in 1905 about $2200.00 and consisted of a 40 h.p. boiler; 8 h.p. engine; 6 h.p. mill with cane and bagasse carriers; two 200-gallon juice tanks; two 300-gallon defecators; three 300-gallon settling tanks; one 400-gallon evaporator; one boiler feed pump; one juice pump; one sulphur apparatus consisting of stove, cooling tank and sulphur box; together with all necessary pipe, copper steam coils, valves and other fittings for connecting all into

a working unit. This machinery was housed in a building 26 feet wide and 72 feet long, with 22 feet side walls and an extreme height of 30 feet. This apparatus was so arranged that the boiler, engine and cane mill set on the ground floor; the juice tank was sunk into the ground so that the top of it was on a level with the ground floor. The juice was picked up from this tank by a rotary pump run by the same shaft which turned the cane mill and was pushed to the extreme height of the building where it entered the top of the sulphur box and flowed back and forth over a series of super-imposed copper shelves where it came intimately in contact with fumes from burning sulphur which entered this box from below and passed out at the top. This sulphur was burned in a small stove also set on the ground floor and the fumes were conducted through a two-inch pipe (surrounded by running water) into the sulphur box, the quantity of fumes being regulated by a steam jet which entered the escape pipe at the top of the sulphur box. After the juice was bleached it entered a second juice tank from which it was directed into one or the other of two evaporators or defecators placed on what might be called the third floor of the building (the sulphur box being set on the joists). These defecators were provided with copper steam coils and it was here that the juice was first heated and the blanket of impurities which rose to the top brushed off into troughs extending entirely around each defecator. Milk of lime was then added to the point of neutrality as measured or determined by the use of litmus paper or by the eye when properly trained, and the cleaning was continued here for some time. After the juice in the defecators was so clean that no particles were to be seen coming to the surface as the boiling continued, a small amount of "Clariphos," a preparation of phosphoric acid, was added at the rate of about three quarts diluted with several times this volume of water, for every one thousand gallons of juice. The juice was then drawn off into settling tanks placed to one side of the building and just a little lower than the defecators. The "Clariphos" precipitated any excess of lime that may have been added and carried down with it a quantity of other impurities. After settling for at least two hours the juice was drawn into the evaporator placed on a still lower level, where the cleaning process was continued and it was finally brought under vigorous boiling to the consistency of syrup as determined by the Beaume hydrometer or saccharometer which should indicate a gravity of about 34 degrees. At this point the steam was quickly turned off and the syrup turned by means of a large gate valve into a cypress tank still lower down from which it was drawn while still hot into bottles, jugs, barrels, cans, etc.

We found all the apparatus and processes above described by no means necessary to make a good quality of syrup that would meet the market requirement, though it did give a very bright syrup that had an excellent flavor and kept to perfection. Later we did away with the use of sulphur and clariphos with no bad results except the product was a little darker in color. One of the largest and most successful syrup makers in this state who cooks by steam uses a single evaporator without either defecators or

settling tanks. He made this evaporator at home out of cypress boards and the necessary steam coil out of 2-inch galvanized iron pipe cut in lengths to fit the evaporator and connected with return bond elbows. He uses an ordinary siphon jet for pumping the juice, wooden troughs wherever possible for conducting syrup and juice, and wooden tanks entirely for holding juice, skimmings and syrup. In fact, aside from the boiler and engine which he utilizes at times to saw lumber and a cane mill which was bought second hand, this party made every thing else about the factory at home. It is an easy matter to make defecators, evaporators and juice tanks out of wood and we believe they are superior to galvanized iron for the reason that they are less likely to color the syrup. A convenient evaporator may be made of 2x10 cypress lumber bored with a 11-16 inch ship auger and bolted together every three feet with 5-8 inch iron rods. The factory just mentioned belongs to the Allen Bros. of Emerald, Miss., and has an evaporator made of this material and in this manner. This evaporator is ten feet long, five feet wide, and three and one-half feet high, with flanged top on three sides and a trough to catch skimmings on the other end.

Containers for syrup.—The tin can is the best package for syrup that is to be sold to the consumer, the barrel where it is to be sold to the dealer who expects to work it over in any way. There are all kinds and sizes of these cans and we found that under average conditions the 10-pound or short gallon can was the most satisfactory. Smaller cans involved too much labor in handling where machinery for filling was not available. We also found friction top cans more satisfactory than those on which the tops had to be soldered. The wide mouth friction top can was satisfactory for syrup sold near home and where shipping on trains was not necessary, but such cans would not stand rough handling unless specially crated or partially soldered as the tops would come off and cause much loss. In fact, the railroads finally refused to accept such cans for shipment except under the conditions named. The small mouth friction top cans sold as the "Record Patent" was found to be the most satisfactory can for shipment, being easily filled, quickly covered, and an altogether satisfactory shipper. The screw top can was satisfactory in every way except the opening was too small to fill rapidly.

The cheapest cans are the ones that have to be soldered and these are quite satisfactory where syrup is canned in sufficient quantities to justify machines for filling and apparatus for soldering, but to the average farmer the labor in soldering these cans properly would more than offset the added cost of the friction top and besides the local trade prefers the wide mouth can because when the syrup is gone a useful vessel is left in the empty can. For certain fancy trade bottles are desirable, but the average farmer is in no position to pack them. Bottles and jugs are alright for home use, but unless well stoppered expansion in summer will cause much loss from being pushed out. It mattered not how carefully our syrup was made, if placed in kegs or barrels fermentation would set up in the summer unless

these containers were put in cold storage. It is needless to say that in any package neatness and attractiveness of appearance has much to do with the sale of the contents and that proper labeling of any container will pay handsomely.

Markets.—There is almost an unlimited market for first class cane syrup that has an established reputation. The syrup makers mentioned in this pamphlet can sell and do sell their syrup at remunerative prices largely on local markets and many other growers and makers of cane syrup in South Mississippi could, by adopting certain of their methods, greatly enhance the value of their product. But even these men could not greatly increase their production over supplying their present markets and possibly none of them are in a position to find other markets remote from their home towns in this and other states.

From an economic standpoint the bulk of the sugar cane in this section should continue to be grown by the numerous small farmers, the majority of whom will never standardize the syrup made from it nor be able of themselves to find markets for any greatly increased production. Community factories on the order of the one put in by the station at McNeill and patronized by the farmers within hauling distance would insure at least the best grade of syrup, but it is questionable if with the country so thinly populated sufficient cane would be grown in hauling distance of such a mill to make enough syrup to justify the expense required in maintaining the proper selling organization necessary in marketing this syrup. Sugar cane is so heavy and difficult to haul that at least in the case at McNeill we were never able to get any great quantity brought to the mill, nothing like enough to justify so large an investment in an outfit of the kind.

We rather think the solution of the problem lies in a cooperative movement among the farmers of a much larger territory by which these individuals would continue to grow and handle their cane as at present, keeping so much of the syrup as was needed to supply their homes and local markets and pooling the surplus with some central cooperative organization that would take it, separate into the necessary grades, reboil to the extent required, standardize and can the resultant syrup, to which they would give brand names and let it enter the channels of trade just as other products of the kind are now marketed. With a cooperative organization, aside from the initial investment in the necessary factory equipment, no great amount of capital would be required, certainly no more than enough to buy cans and meet certain small current expenses and this could easily be obtained from local banks.

To just what point of concentration this syrup would have to be boiled before leaving the individual farms experience might have to determine. Certainly the more it was concentrated up to the point at which it might be taken by the central factory and worked into the best quality of syrup, the cheaper would be the cost of hauling or freighting to this factory. No

exact standard would be possible or necessary for with the saccharometer each barrel as it was received could be measured as to sugar content and credited to the individual producer. Our judgment would be that any syrup cooked to 30 degrees at or near the boiling point would keep sufficiently long without fermentation, especially at the time of year when it is made, to enable it to be handled at the factory without injury from souring. It might be necessary for the management of this central organization to give more or less supervision to the handling of this syrup on the individual farms, at least to the point of seeing that it was well cleaned during the process of boiling, but the establishment of grades under which it would be taken and finally paid for by the central plant would finally force the growers to the exercise of proper care in the handling of their product.

Sorghum.—There is very little sorghum grown for syrup making as far south as we are located and the writer has had no actual experience in growing the crop for this purpose. However, it is grown by this station for silage making almost to the exclusion of corn or any other crop. Under average conditions, considering droughts, injury from insects, unseasonable plantings, etc., we believe our tonnage from sorghum made into silage has easily approximated 75% greater than the same land planted to corn and by allowing this sorghum to ripen thoroughly before putting it in the silo we find it equally as nutritious and palatable. Sorghum has a decided advantage over sugar cane in the expense of seeding, fertilizing and cultivating as well as in the length of the growing season. We have planted certain of the early maturing varieties here after the first of August and have had them mature and be put into the silo before injured by frost. So, under many conditions, even so far south as we are, it may pay to grow sorghum as a syrup crop. This is especially true under the tenant system of handling plantation labor where such labor is too shiftless to look more than a few weeks ahead and entirely too careless to provide themselves with the sugar cane necessary to plant even a small acreage.

The cost of seeding an acre to sorghum amounts to little and if seed are saved at home might be disregarded. However, there is possibly more to be gained by careful seed selection in developing and maintaining strains of sorghum rich in sugar content than with any other plant in the entire list of field crops. In work done at the A. & M. College twenty odd years ago, the writer grew and determined the sugar content in a number of kinds of sorghum and found this to vary greatly, so it would appear that one of the stations with facilities for analyzing sorghum juices might do much good in developing, distributing and maintaining high producing strains of sorghum for syrup making, particularly if the crop is grown to any extent by the farmers of North Mississippi where sugar cane cannot be grown economically. Where sugar cane can be grown so successfully as with us in this latitude, particularly with a population of small white farmers who own their own farms so decidedly in the majority, we can see no need of growing sorghum to any extent, because, as we see it, the sugar cane syrup is so superior as to be incomparable.

Rotations. Cropping land in corn continuously is not a good practice. Insect and fungus diseases will be less troublesome, yields will be better, and the general fertility of the soil can be maintained more easily if a good system of rotation is followed. The crops put into the rotation are determined largely by the type of farming followed. For diversified farming, a three-year rotation consisting of corn with cowpeas sown in the middles at the last cultivation, oats and vetch followed by cowpeas, and cotton the third year gives good results. A dairy farmer will probably prefer to shorten rotation to two years, leaving out the cotton and growing corn every other year. A cotton farmer will prefer to lengthen the rotation to four years and grow cotton two years in succession.

Soils Adapted to Corn. The best soil for corn is well drained, rich, sandy loam which contains a fair amount of humus. Most of the valley soils in the area covered by this bulletin can be made to produce good corn and the black Houston clay soils of the Northeast Prairie as well. Growing corn for grain on the thin hill lands of Central Mississippi and in the Flat Woods belt is seldom profitable.

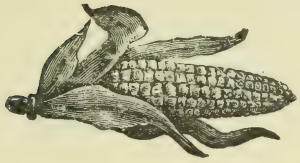
Source of Seed. Below is a list of the parties from whom the seed used in the variety tests in 1920 was obtained:

Champion Early White Dent	Harpeth Valley Seed Co., Franklin, Tenn.
Cocke's Prolific	Mississippi Experiment Station
Florida Flint	Mississippi Experiment Station
Goliad	Mississippi Experiment Station
Gerrick	Mississippi Experiment Station
Hastings	Hastings Seed Co., Atlanta, Ga.
Jones' Prolific	Mississippi Experiment Station
Johnson County White	Mississippi Experiment Station
Laguna	Mississippi Experiment Station
Mosby (Station)	Mississippi Experiment Station
Mosby-553	Mississippi Experiment Station
Mosby (Ewing)	E. C. Ewing, Scott, Miss.
Mosby (Wodruff)	A. S. Woodruff, Batesville, Miss.
Marlboro (Wannamaker)	W. W. Wannamaker Seed Co., St. Mathews, S. C.
Mexican June	R. K. and F. L. Weir, Starkville, Miss.
Marlboro (Coker)	Pedigreed Seed Co., Hartsville, S. C.
North Carolina Prolific	Tucker-Mosby Seed Co., Memphis, Tenn.
Paymaster (Station)	Mississippi Experiment Station
Paymaster (Harpeth)	Harpeth Valley Seed Co., Franklin, Tenn.
Simmons' Prolific	Harlow Simmons, Warnerton, La.
Tennessee Red Cob (Station)	Mississippi Experiment Station
Tennessee Red Cob-72	Mississippi Experiment Station
Vardaman	Mississippi Experiment Station

BULLETIN No. 198 JANUARY, 1921

CORN VARIETY TESTS 1913 to 1920

DELTA BRANCH STATION
W. E. AYRES



MISSISSIPPI
AGRICULTURAL EXPERIMENT STATION

J. R. RICKS, Director

INTRODUCTION.

The production of milk is the ground work of all the dairy industry. The amount of and the quality of milk produced determines the extent to which the manufacture of milk products can go on and the amount of milk or milk products that is available for consumption. The amount of milk produced and the economy with which it is produced is determined by the quality, as well as the number, of the cows milked and the quality of the men that are caring for these cows. The number and quality of the cows that are furnishing the milk today was determined by the attention given to the breeding of and care of the calves of yesterday. Likewise, the attention given the calves that are being bred and grown now will determine, to a great extent, the cows that are milked the next few years. In other words, the future of the dairy industry depends to a great extent on the care given to the breeding and developing of the dairy calf. Because of this fact and because we felt the need of more attention to the calf crop in the state, the work outlined in this bulletin was carried out the past winter. This work was planned to determine the relative rate of growth or gain, and the amount of food, grain and hay, that was consumed in making this gain by the calves of the different dairy breeds, under farm conditions. This work has a practical bearing in that it gives an indication as to the amount of grain that should be fed the calves of the different breeds and also the amount of hay that the individuals of the different breeds will use during the first six months of their life. Either or both of these facts might have an influence at times in determining which breed of cows is best suited to certain farm conditions. They indicate that there is a relation between the choice of a breed at times and the available supply of roughage, or grain, or both.

PLAN OF WORK.

For this work the calves of three breeds were available, viz.: Ayrshires, Holsteins, and Jerseys. In selecting the calves the endeavor was made to have the individuals of each breed as near of an age as possible. It was not possible to keep each calf separate, which would have been preferable. The next best plan and the one used was to put the calves of each breed by themselves. This necessitated that the calves of each breed be as near of an age as possible. Four Ayrshires, two Holsteins, and four Jerseys were used. At the time of starting the work, November 27, 1920, there were three Ayrshires available, aged as follows: One, 22 days; one, 20 days; and one, 6 days. Two more were born on November 29, and December 1, respectively, and were placed in the pen when taken from their mothers. The oldest Ayrshire sickened and died in December and allowance was made for this in determining feed records. The rest were normal and quite thrifty.

The two Holsteins were dropped on November 26 and November 27, respectively, and were vigorous all during the trial.

The four Jerseys used were available at the start. At this time they were aged as follows: two, 32 days; one, 24 days; and one, 17 days. They were all vigorous and continued so during the trial. The sex of

calves might have influenced the amount of grain and hay eaten. The Ayrshires were all bulls, the Holsteins both heifers, while three of the Jerseys were bulls and one a heifer. Usually a bull calf will consume more feed than a heifer.

FEEDING THE CALVES.

In raising the calves the method usually followed at the station was used. The calves were allowed to suck their mothers until two days of age, except in the case of two Jerseys, which were taken away at one day. They were offered milk about 12 hours after being taken from the mother and usually were taught to drink with little difficulty. In case a calf did not drink readily, it was not forced, but was left until the next feeding. This usually gave an appetite that made it take the milk quite readily. The milk of the dam was used for the first seven days and was fed at once after milking. About four pounds, or two quarts, were used at a feed, except in the case of some of the Jerseys which, depending on size and vigor, were started on three or three and one-half lbs., increasing the amount later. This amount was fed twice a day, warm from the cow. Whole milk was fed for the first four weeks, using herd milk after the first week and feeding before it had lost the animal heat. At four weeks a gradual substitution of warm skim milk for the whole milk was begun. In doing this the change was made at the rate of one-half pound at a feed, taking a week to complete the substitution. The amount of milk fed was usually increased at time of changing to skimmilk to four and one-half or five lbs. This increase depended on the size and vigor of the calf. The maximum amount of skimmilk fed was intended, originally, to be five pounds at a feed or ten pounds a day. However, having a liberal supply of milk we increased this to twelve pounds a day toward the end of the trial. The milk was separated and fed at once, while warm.

Grain was kept before the calves from the start. The grain used was a mixture of equal parts of cracked-corn and oats by weight. The calves were allowed all the grain they desired until they were eating an average of two pounds a day. Later the limit of the amount fed was increased to three pounds a day.

Hay was kept in a rack in reach of the calves from the start. They were allowed all the hay they would eat. The best quality of hay on hand was used and was Johnson grass with a sprinkling of alfalfa. The hay was weighed out to each pen and records of these weights recorded.

They had access to water as soon as they would drink it and were allowed all they desired. On bright days they were allowed the run of a small yard.

The calves were weighed at birth and once each week afterwards. Each was weighed on the day it was six months of age. The weighings were taken at the same time of day and as nearly as possible under the same condition each time.

TABLE I—*Average Daily Feed and Gain Record by the Week*

	HOLSTEINS					JERSEYS					AYRSHIRES					ALL BREEDS				
Period	Milk	Grain	Hay	Ave. Gain	4 Wks.	Milk	Grain	Hay	Ave. Gain	4 Wks.	Milk	Grain	Hay	Ave. Gain	4 Wks.	Milk	Grain	Hay	Ave. Gain	4 Wks.
1st. "	8.	.....	.....	.321	.....	7.	.....	.....	.025	.....	8.	.....	.....	.268	.....	.....	.....	.....	.078	.....
2nd. "	8.	.....	.32	.93	.....	7.75	.....	.....	.821	.....	8.	.035	.....	.625	.....	8.	.014	.064	.764	.....
3rd. "	8.	.....	.....	.57	.....	8.	.....	.....	.732	.....	8.125	.143	.....	.876	.....	8.	.057	.....	.757	.....
4th. "	8.	.143	.286	.643	.585	8.	.089	.036	.875	.674	8.	.393	.18	1.143	.728	.8.	.2214	.1436	.936	.6778
5th. "	8.	.....	.....	1.6	.....	8.	.32	.339	1.036	.....	8.25	.393	.214	1.143	.....	8.1	.2852	.2214	1.1916	.....
6th. "	8.	.75	.....	1.46	.....	8.	.607	.196	.928	.....	8.25	.803	.464	1.053	.....	8.1	.714	.264	1.0812	.....
7th. "	9.	.964	.857	1.57	.....	8.	.768	.348	.821	.....	8.75	1.15	.44	1.089	.....	8.5	.96	.486	1.078	.....
8th. "	10.	1.39	.....	1.57	1.55	8.	.875	.277	.696	.87	9.5	1.214	.723	1.57	1.214	9.	1.1136	.4	1.234	1.144
9th. "	10.	1.7	.929	1.608	.....	8.	.946	.768	.697	.....	9.75	1.66	1.8	1.5	.....	9.1	1.382	1.213	1.2	.....
10th. "	10.	2.15	2.	.964	.....	8.25	1.161	1.09	1.178	.....	9.75	1.73	3.09	1.339	.....	9.2	1.556	2.072	1.199	.....
11th. "	10.	1.85	2.28	2.11	.....	8.75	1.34	1.68	1.285	.....	10.1	1.8	3.375	1.232	.....	9.5	1.626	2.478	1.435	.....
12th. "	10	2.03	1.14	1.18	1.473	9.5	1.4	2.14	1.	1.04	10.	2.	3.87	1.356	1.357	9.8	1.766	2.632	1.178	1.253
13th. "	10.	2.	3.07	.75	.....	10.	1.44	2.61	.946	.....	10.	1.87	3.92	1.249	.....	10.	1.724	3.226	1.028	.....
14th. "	10.	2.	4.85	1.213	.....	10.	1.34	3.44	1.036	.....	10.	1.92	3.37	1.072	.....	10.	1.704	3.694	1.086	.....
15th. "	10.	2.	3.64	1.18	.....	10.	1.59	3.66	1.018	.....	10.	1.98	3.8	1.465	.....	10.	1.828	3.712	1.229	.....
16th. "	10.	2.	5.	1.89	1.258	10.	1.48	3.8	.965	.991	10.	1.95	3.83	.964	1.187	10.	1.772	4.052	1.149	1.1228
17th. "	10.	2.	6.2	1.29	.....	10.	1.49	3.65	1.036	.....	10.	1.98	3.68	1.64	.....	10.	1.778	4.172	1.328	.....
18th. "	10.	2.	4.93	1.64	.....	10.	1.64	3.3	.536	.....	10.	2.	4.02	1.607	.....	10.	1.856	3.914	1.185	.....
19th. "	10.	2.	6.3	2.2	.....	10.	1.69	3.14	.75	.....	10.	2.	4.51	1.714	.....	10.	1.876	4.32	1.4256	.....
20th. "	10.	2.64	8.07	1.5	1.66	10.	1.78	3.77	.929	.812	10.	2.	4.74	1.107	1.517	10.	2.04	5.018	1.114	1.2636
21st. "	12.	2.78	8.43	2.43	.....	10.	1.58	3.33	.643	.....	11.	2.	5.05	2.356	.....	10.8	1.988	5.038	1.686	.....
22nd. "	12.	2.35	8.07	.61	.....	10.	1.61	3.98	1.392	.....	11.5	2.	5.11	1.357	.....	11.	1.914	5.25	1.227	.....
23rd. "	12.	2.5	9.57	1.86	.....	10.	1.625	4.19	1.071	.....	11.5	2.02	5.07	1.036	.....	11.	1.958	5.618	1.215	.....
24th. "	12.	2.29	9.1	2.29	1.803	10.5	1.74	4.76	1.322	1.107	12.	2.2	5.18	2.	1.687	11.4	2.034	5.796	1.787	1.4782
25th. "	12.	2.29	9.29	1.	.....	11.	1.81	4.83	1.107	.....	12.	2.34	5.43	1.143	.....	11.6	2.118	5.962	1.100	.....
26th. "	12.	3.	9.4	1.636	1.34	12.	1.825	4.53	1.297	1.2016	12.	2.37	5.68	1.98	1.509	12.	2.278	5.96	1.648	1.3522

DISCUSSION OF RESULTS.

All the calves were normal at the start of the work and continued so, except for the one Ayrshire that died in December. The rest of the calves were vigorous and growthy throughout the trial.

Table 1 gives the average daily gains made and the average daily milk, grain and hay fed to each group during each week until six months of age. According to our records very little grain was consumed by any of the calves until the beginning of the fourth week. The Ayrshires did use a little grain the second week and about one-seventh of pound a day during the third week. This is probably a little more grain on the average than would normally be eaten, and appears in our records, no doubt because of nearly three-week's difference in the age of the oldest and youngest Ayrshire; the younger calves getting credit perhaps for some of the grain eaten by the older calf.

During the fourth week all the groups were using grain, the Jerseys the least, and the Ayrshires leading with over one-third of a pound a day. From this time, the amount of grain eaten daily increased steadily. At twelve weeks the Holsteins and Ayrshires were eating two pounds of grain per calf a day. Later the maximum amount of grain allowed per calf was increased to three pounds. The Holsteins were eating this much at six months of age, the Ayrshires were handling two and one-half pounds a piece and very soon took the three pounds. The Jerseys never did consume two pounds a day each freely in the first six months. However they were taking practically that much at the close of the trial.

Scarcely any hay was eaten by any of the calves until the fourth week. The Holsteins seemed to care the least for hay at this time, using during the fourth, fifth and sixth weeks an average of about .1 of a pound a day, against .2 of a pound a day for the Jerseys and nearly .3 of a pound a day for the Ayrshires. From the seventh week on the average amount of hay eaten a day increased rapidly. The Ayrshires consumed the most per day until the sixteenth week. From this time on the Holsteins averaged more hay per head than either of the other groups; and the Jerseys the least. At the end of the feeding trial the Jerseys were consuming from four and a half to five pounds a day on average, against five and a half to six pounds for the Ayrshires and nine to nine and a half pounds for the Holsteins.

The average daily gains of each group increased steadily as the calves grew older and larger. Table 1 gives the average daily gains for each week during the trial of the different groups. The Jerseys made the lowest average gains per day and the Holsteins the largest, while the gains of the Ayrshires were intermediate but showing nearly as large a gain as the Holsteins. This is to be expected when we consider the relative size of the mature animals of the different breeds.

The gains of the individuals of each breed are in relation to the gains of the groups of each breed. The two Holsteins made a daily average of 1.345 pounds and 1.414 pounds respectively. If we look at table II we see that the lowest weekly gain recorded for either of these, with the exception of the first week when one lost four and one-half pounds (while being

TABLE II—*Showing Individual Gains by the Week*

WEEK	HOLSTEIN		JERSEYS				AYRSHIRES			
BIRTH	66.5	89.	56.	55.	63.	5.65U	79.	57.5	74.	80₁.
1	4.5	-4.5O	2S.	-1S.	-2U.	-1.5U	-9.R	-3.5R	0.	-5U.
2	6.	4.5	5.	5.5	5.	7.5	0	5.5	7.	5.
3	3.5	7.	6.	7.	3.	4.5	12.	6.5	3.	3.
4	2.5	4.5	5.	5.5	8.	6.	8.	8.	8.	8.
5	10.	6.5	5.	8.	8.	8.	7.	10.	8.	7.
6	9.	12.5	4.	7.	5.	10.	6.	8.5	6.	9.
7	9.	11.5	5.	9.5	3.	5.5	5.	8.5	6.	11.
8	10.	13.	-1.	6.	11.	3.5	9.	11.	12.	12.
9	12.	12.	3.	-1.5	8.	10.	19.	10.	5.	8.
10	8.	10.5	6.	9.	11.	7.	10.	14.	5.5	8.
11	13.	5.5	7.	9.	10.	10.	11.	8.	8.5	7.
12	8.	17.	6.	9.	6.5	6.5	8.	11.	11.	8.
13	6.	8.5	5.	12.	5.	4.5	7.	12.	7.	9.
14	6.	4.5	7.	3.5	13.5	5.	12.	8.	0.	10.
15	10.	11.	7.	2.5	11.	8.	10.	10.	14.	7.
16	14.	6.5	0.	10.	7.	10.	5.	7.	3.	12.
17	8.	12.5	10.	8.	7.	4.	11.	9.	12.	14.
18	10.	10.	2.	5.	3.	8.	14.	16.	10.	5.
19	16.	13.	6.	5.	7.	3.	4.	14.	14.	16.
20	11.	15.	6.	4.	10.	6.	7.	14.	3.	7.
21	16*.	10*.	5.	5.	5.	3.	12.	20.	18*.	16*.
22	4.	18.	8.	9.	13.	9.	8.	18*.	5.	7.
23	10.	5.	7.	6.	4.	13.	11.	2.	6.	10.
24	19.	16.	10.	13.	7*.	7.	27*.	10.	14.	5.
25	4.	13.	9.	11.	1.	10*.	0.	10.	7.	15.
26	14s.	10.	10R.	11.5R	14R.	6R.	11U.	10U.	13S.	2.5
27		3O.								11 5A
TOTAL ..	243.5	256.	145.	180.5	184.	170.5	243.	262.5	206.	228.

*—Access to water before weighting.
1—Weighed at 20 days.
0—Three day's gain.
S—Six day's gain.
R—Eight Day's gain.
U—Five day's gain.
A—Two day's gain.

taught to drink), was two and one-half pounds during the fourth week. The most gain recorded is nineteen pounds during the twenty-fourth week for the same calf.

The four Ayrshires made average gains of 1.45 lbs., 1.3425 lbs., 1.25 lbs., and 1.138 lbs., respectively. Two made gains equal to the two Holsteins, the other two making gains that were lower. As with Holsteins, Table II shows us that one Ayrshire lost weight while learning to drink and another held its own. During the fourteenth week one registered no gain. Another showed no gain on two different weeks, the second and the twenty-fifth. The highest gain recorded was 27 pounds during the twenty-fourth week. As this was followed by no gain the next week some of the gain was no doubt due to a fill, the calf having had access to water before weighing, which was not the usual rule.

The four Jerseys gained .797 pounds, .99 pounds, 1.016 pounds, and .942 pounds. These calves were all healthy and thrifty. Only one gained a pound a day, although two others were very close to that mark. The three that made the highest gains were all bulls, while the one heifer in this group averaged .797 pound a day. She was healthy and vigorous at all times and her gains were steady. Two of the Jerseys lost in weight during the time they were being taught to drink. At two other weighings a calf registered a loss each time. The highest gain recorded was 13.5 pounds during the fourteenth week.

Table II shows the gains of the individuals of each breed for each week during the trial. This table tells us that the Holsteins averaged

TABLE III—*Showing Average Daily Gain; Grain to Gain; Hay to Gain by Four-Week Periods*

	HOLSTEIN					JERSEYS					AYRSHIRES					ALL BREEDS				
	Ave.	Grain		Hay		Ave.	Grain		Hay		Ave.	Grain		Hay		Ave.	Grain		Hay	
PERIOD	Gain	Daily	1 lb.to Gain	Daily	1 lb.to Gain	Gain	Daily	1 lb.to Gain	Daily	1 lb.to Gain	Gain	Daily	1 lb.to Gain	Daily	1 lb.to Gain	Gain	Daily	1 lb.to Gain	Daily	1 lb.to Gain
1st. 4 Wks.	.585	.036	.0006	.1515	.026	.674	.0225	.033	.009	.0133	.728	.1427	.196	.045	.0618	.678	.0743	.0917	.0519	.0352
2nd. 4 Wks.	1.556	.776	.5	.214	.138	.87	.6425	.738	.293	.333	1.214	.89	.733	.46	.38	1.144	.6285	.6885	.3418	.3128
3rd. 4 Wks.	1.473	1.93	1.31	1.587	1.08	1.04	1.212	1.16	1.419	1.35	1.357	1.7975	1.32	3.034	2.233	1.253	1.59	1.254	1.604	1.65
4th 4 Wks.	1.258	2.	1.59	4.14	3.29	.991	1.4625	1.47	3.38	3.3	1.187	1.93	1.62	3.74	3.15	1.1228	1.757	1.554	3.676	3.24
5th. 4 Wks.	1.66	2.16	1.3	6.375	3.83	.812	1.65	2.03	3.465	4.25	1.517	1.985	1.3	4.2375	2.8	1.2636	1.866	1.592	4.356	3.586
6th. 4 Wks.	1.803	2.46	1.375	8.77	4.86	1.107	1.634	1.467	4.565	4.1	1.687	2.055	1.22	5.1	3.02	1.478	1.97	1.35	5.62	3.82
Last 2 Wks.	1.34	2.64	1.97	9.34	7.	1.2016	1.817	1.51	4.68	3.89	1.509	2.355	1.56	5.555	3.68	1.352	2.2	1.62	5.96	4.43
26 Wks.	1.379	1.61	1.171	3.82	2.765	.936	1.173	1.252	2.33	2.49	1.295	1.533	1.183	2.97	2.296	1.169	1.404	1.21	2.884	2.47

eight weeks; the Ayrshires six and one-fourth weeks; and the Jerseys thirteen and one-half weeks during which they gained less than one pound a day. According to this table the relation between birth weights and total gains is not constant. The calf that made the greatest gains was an Ayrshire and was one of four lightest calves at birth. The largest Ayrshire at birth was third in the amount of gains made, while the lightest Ayrshire at birth made the most gains. The largest Jersey at birth made the greatest gain, but the smallest Jersey at birth was second in amount of gains. A heifer and a bull which at birth weighed within one-half pound of each other, at six months varied twenty-five pounds, the heifer being the lightest. The two Holsteins stood in the same relation as to gain as they did to weight at birth.

Table IV gives the average daily, weekly and total gains of the calves in each group and of all the calves for each successive four-week's period and for the entire twenty-six weeks.

The average amount of hay and grain used daily by the individuals of each group and of all groups and the amount of grain and hay required for each pound gain during each successive four-weeks period is given in Table III. It is indicative of the part milk plays in the food of a young calf when we note how in each successive period the amount of hay or grain

TABLE IV—*Showing Average Gain by Four Week-Periods*

	HOLSTEINS			JERSEYS			AYRSHIRES			ALL BREEDS		
	Daily	Wkly.	Total	Daily	Wkly.	Total	Daily	Wkly.	Total	Daily	Wkly.	Total
			29.5 d.			26.5 d.						27.7d.
1st. 4 Weeks	.585	4.095	17.5	.674	4.718	16.875	.728	5.094	20.375	.6778	4.7446	18.77
2nd. 4 Weeks	1.555	10.875	43.5	.87	6.094	24.375	1.214	8.5	34.	1.144	8.008	32.05
3rd. 4 Weeks	1.473	10.312	41.25	1.04	7.28	29.125	1.357	9.5	38.	1.253	8.77	35.1
4th. 4 Weeks	1.258	8.87	35.25	.991	6.937	27.75	1.187	8.31	33.25	1.123	7.86	31.4
5th. 4 Weeks	1.66	11.625	46.5	.812	5.687	22.75	1.517	10.625	42.5	1.264	8.845	35.4
6th. 4 Weeks	1.803	12.625	50.5	1.107	7.75	31.	1.687	11.81	47.25	1.478	10.346	41.5
			11½d.			15 d.			13¼ d.			13.6d.
Last 2 Weeks	1.34	9.38	15.5	1.2016	8.41	18.125	1.509	10.566	20.	1.3522	9.4654	18.39
			181 d.			181½d			181¼d			181¼d
Whole 26 Wks.	1.379	9.653	249.75	.936	6.552	17.0	1.295	9.065	234.87	1.169	8.18	211.9

to the pound of gain in weight is increased. This shows that the young calf depends entirely on milk at the start of its life, and, as it grows older, depends more and more on the other food stuffs. If these averages of the grain and hay eaten in relation to the gain made or in toto are read over carefully we will notice an increasing amount of each used by the calf as it grows in age and size. We will also notice that the larger breeds while using more grains in all, use less to the pound of gain. The amount of hay used in relation to the average gain bears similar relation as the grain.

The Holsteins, however, used the most hay, the Jerseys next, and the Ayrshires the least. The calves of the two larger breeds consumed a greater total amount of hay on the average than did the Jerseys.

Table V gives the individual total gains of the calves in each group and also the total gain and average gain of each group. The largest total gain was made by an Ayrshire. Two Holsteins made gains that were intermediate to the largest and next largest Ayrshire gains. If we average the gains of these two Ayrshires we find them making an average of 252.7 pounds or 3 pounds more than the average of the two Holsteins. One Ayrshire made a gain of 206 pounds. This calf at birth weighed 74 pounds and it is hard to tell just where it failed to keep up with the others. It was perhaps less thrifty than the others for its coat was rough and general

appearance not of the best the last three months. The Ayrshire gaining the most was lighter by almost 17 pounds at birth than the next lightest Ayrshire. Yet it weighed within two pounds of the heaviest Ayrshire at six months of age. It was only one and one-half pounds heavier than two of the Jerseys at birth yet out-weighed them at six months by 93 pounds and 34 pounds.

None of the four Jerseys made gains equal to the calves of the other breeds. This was not due to a lack of vigor, as all were vigorous and thrifty.

According to Table V the Holsteins ate on an average more at six months of age than the Ayrshires or Jerseys, though the Ayrshires handled very nearly as much. The grain to the pound of gain was very similar in Holsteins and Ayrshires, the former requiring .012 of a pound less of grain to the pound of gain. The Jerseys used .07 of a pound more of grain to one pound gain than the Ayrshires. The grain fed to three Holstein or Ayrshire calves would feed four Jersey calves.

The Holsteins also ate more hay on the average than other breeds. The hay required for four Holstein calves until six months of age would furnish feed for six and one half Jerseys, or for five Ayrshires.

The total amount of grain and of hay eaten was less for the Jerseys, and most for the Holsteins with Ayrshires intermediate in the amount they used. The Holsteins used less grain to one pound of gain, with Ayrshires using very nearly the same and the Jerseys the most. However, in this trial the Jerseys used less hay to the pound of gain than did the Holsteins, but .2 of a pound more than did the Ayrshires.

SUMMARY.

1. The gains in weight are in keeping with mature weights of the animal.
2. The gain of any one week is not an index to the average gain.
3. A calf depends entirely on milk for its food at first and should have it.
4. Calves will not eat much grain or hay before the third or fourth week.
5. We cannot expect to make as large average gains with the smaller breeds as with the larger breeds under the same condition.
6. The amount of hay and grain used in proportion to the weight of the animal and in toto increases steadily as the calf grows older.
7. The larger breeds are apt to show a greater amount of gain to a certain amount of grain or hay than the smaller breeds.
8. The larger breeds will use a greater total amount of hay or grain than the smaller breeds.
9. Three Holsteins, or four Ayrshires, or five Jerseys used a total of one ton of hay at six months of age.
10. Seven Holsteins, or seven Ayrshires or nine Jerseys used a total of one ton of grain at six months of age.

NOTES ON CALF RAISING.

Selecting Calves to Raise.

It is questionable if one dealing with the dairy breeds, pure-bred or grade, should attempt to raise every calf dropped. There is an occasional runt or a calf that is unthrifty from birth. This calf, unless of some special blood line, is not desirable to grow out, and it is doubtful if it should be used for breeding purposes at all. A runt calf at the station, as large at birth as other calves of the same breed, failed to make satisfactory gains at any time. At six months of age it was 30 pounds to 70 pounds smaller than normal calves of the same breed.

The Ohio Station reports feeding skimmed milk to an unthrifty calf until one year of age. This heifer was 100 pounds under average weight

TABLE V—*Showing Total and Average Gains. Also Grain and Hay Eaten*

Breed	Number Animals	Gains. Individual.				Gains. Total	Grain Average	Grain Total	Grain Average	Grain To 1 lb. Gain	Hay Total	Hay Average	Hay To 1 lb. Gain
Holsteins	2	256.	243.5	.....	.....	499.5	249.75	585.	292.5	1.171	1.381	690.5	2.765
Ayrshires	4	262.5	243.	228.	206.	939.5	234.9	1111.5	277.875	1.183	2157.75	539.44	2.296
Jerseys	4	184.	180.5	170.5	145.	680.	170.	851.5	212.9	1.252	1694.25	423.56	2.49
All	10	.....	.....	.....	.....	211.9	211.9	2548.	254.8	1.202	5233.	523.3	2.47

Holsteins [249.75]—Jerseys [170]—79.75 pounds more gain on average favor Holsteins.
Holsteins [249.75] —Ayrshires [234.9]—14.85 pounds more gain on average favor of Holsteins.
Ayrshires [234.9]—Jerseys [170]—64.9 pounds more gain on av erage favor of Ayrshires.

Holsteins [692.5]—Jerseys [212.9]—79.6 pounds less grain on average favor of Jerseys.
Holsteins [292.5]—Ayrshires [277.87]—14.63 pounds less grain on average favor of Ayrshires.
Ayrshires [277.87]—Jerseys [212.9]—64.97 pounds less grain on average favor of Jerseys.

Holsteins [690.5]—Jerseys [423.56]—266.94 pounds less hay on average favor of Jerseys.
Holsteins [690.5]—Ayrshires [539.44]—151.06 pounds less hay on average favor of Ayrshires.
Ayrshires [539.44]—Jerseys [423.56]—115.88 pounds less hay on average favor of Jerseys.

of other calves and freshened four months later than the average. It gave birth to a deformed calf and was of no value as a milker.

In grade dairy herds it is advisable to kill all bull calves at birth. Scarcely ever at any later date will they sell for enough to cover the cost of growing. It is never advisable to sell them as breeding stock. Only grade heifers from the best cows and sired by purebred bulls should be raised. A heifer from a nondescript bull and a grade cow is a gamble, she may prove a good milker, but chances are against it. Breed the best cows to a good purebred bull, raise the heifer calves from this mating, and improve your herd.

In pure-bred herds grow out all thrifty heifers, but cull closely when they freshen or after milking a year. It is not advisable to raise all pure-bred bulls. A much better plan is to select the thrifty, well-put-up bull calves from the cows of most merit and, if possible, from cows with a record of production, and grow these out so they will mature into first-class animals.

Do not attempt to grow more calves than you can properly attend to. Grow a few, grow them exceptionally well and your profits will be as much and labor less.

CARE OF DAM.

A calf that is strong and vigorous at birth is more apt to result in a thrifty animal than one that is weak at birth. The condition of the calf at birth is influenced by the feed given the dam while carrying the calf. We must therefore commence feeding the future calf some months previous to its birth by choosing the proper food for the dam. The Wisconsin Station has shown that the proper selection of roughage and grain for the dam determines the vigor and development of the calf she is carrying. They have proved that a ration derived wholly from either the wheat or the oat plant is deficient and will not furnish a ration which will bring about normal growth and reproduction. When the oat ration was modified by substituting for the oat straw, a legume hay, normal reproduction followed. This addition to the wheat ration was not sufficient. However, by adding both corn grain and alfalfa hay to the wheat ration a normal calf resulted. The results at that station have proved that the pregnant cow must receive a ration that contains carbohydrates, flesh forming proteids of the right kind, ash in sufficient amount, and the two essential vitamines, and also contain no toxic substances in sufficient quantities to be injurious.

We can insure successful reproduction by furnishing our breeding stock with some of the legume hays as alfalfa, clover, cow pea, or soy-bean hay; and by the use of corn or sorghum silage, or good pasture grasses as our bulky feeds. In addition to this feed we should give her a grain ration of four or more pounds a day, depending upon the amount of milk and butter fat she is producing and the stage of pregnancy. We can use to form this ration such grains as corn, in the form of corn meal or corn and cob meal, bran, oats or oat meal, linseed meal, soy-bean meal and cottonseed meal.

Always include a legume hay in your rough feed and build your grain ration with corn as a foundation, and feed liberally and your results will be successful. Use cottonseed meal, especially at the last, with a restraining hand. Keep the future mother gaining at all times; and have her dry the last six or eight weeks. Reduce her grain ration the last week or ten days and let it consist mostly of cooling feeds as oats or bran. Keep her away from animals in heat or young stock. When due to freshen place her in a clean grass lot or in a light, freshly cleaned, and well bedded box stall where she will be free from any disturbance. Leave her alone, except for an occasional visit of an attendant, and let nature work. Do not be too eager to help nature, as too early an interference

is as bad as one too long delayed. Give her plenty of time to calve naturally, twelve to twenty-four hours, before you interfere.

THE YOUNG CALF.

Teaching to Drink.

Leave the young calf with the mother for a day and let it suck for two days. The first milk or colstrum is necessary to the young calf to purge out its system and start it out properly.

In teaching the calf to drink, allow about 12 hours to pass after the last sucking, then take about 4 pounds or two quarts of its mother's milk in a pail that is clean and sweet, push the calf into a corner, straddle its neck, hold the pail in one hand, and, letting the calf suck two fingers of the other hand, gradually draw its muzzle into the milk. As soon as it gets a taste of the milk your trouble is usually over, although occasionally a stubborn calf will require more time and much patience.

If left with the mother longer than two days the calf is harder to teach to drink, growing more so the longer it sucks. Only in event the calf is rather weak will it pay to leave it with the dam a longer time.

FEEDING MILK.

Milk is without doubt the best food for the young calf. It is vital for the first four or five days, as without it the young calf will die. It is necessary for proper development for about two or three weeks and should be fed if possible for at least six months. An English writer, J. A. Voelcher, makes the following statement which will be supported by any practical stockman. He says, "The influence of early feeding of calves has an important bearing on the after development and a good start is very essential." The feeding of whole milk, the dam's milk for a week and of herd milk the remainder of the time, for three or four weeks is preferable. A writer states that the development of calves on skim-milk the first three months was not as satisfactory as those on whole milk. Some breeders feed whole milk to their pure-bred calves for six or eight months because of the superior development they claim to attain.

However, under practical circumstances the whole milk cannot be profitably fed over four weeks. Our trials, as reported in this bulletin, show that satisfactory results can be obtained following the above method. C. F. Curtiss, at the Iowa Station, reporting on the results of feeding whole milk against skim-milk says that, while the weight favored the whole milk calves, the cost per pound, the condition, thrift and general appearance; and growth when placed on pasture and grain were in favor of the skim-milk calf. Other experiment station workers have confirmed this report and show that skim-milk calves are successfully reared at about one-third the cost of whole milk calves. C. F. Doane and T. M. Price, in a Maryland Bulletin, report that skim-milk is as digestible as whole milk.

The amount of skim-milk fed is perhaps determined by the size and condition of the calf in question and the amount of milk available. In the trials reported in this bulletin we did not feed over twelve pounds a day. This summer, 1921, we are feeding calves three to six months of age twenty pounds a day in two feeds a day; and are receiving gains of from 10 pounds to 15 pounds per week. The calves are brought to this amount very gradually so as not to throw them off their feed or cause digestive troubles. If it is not possible to separate the milk and feed while yet warm, or if the hand skimming system of creaming is used, it is perhaps advisable to warm the skim-milk to about 95 degrees or 100 degrees F. before feeding. Especially is this true in colder weather and during the first two or three months. Pan skimmed milk is probably superior to separator skimmed milk as a feed as it contains slightly more fat.

Grain for Calves.

According to our tables a young calf will nose over grain about the third week and will be eating an appreciable amount by the fourth week. When feeding skimmed milk, the effort is to replace the fat in the milk by the grain fed.

At the Iowa Station a trial of self-feeders for calves was carried on under direction of Professor McCandlish, where six feeds were available; viz: shelled corn, cracked corn, whole oats, ground oats, oil meal, and wheat bran. When the calves were receiving whole milk they preferred oats to the corn and ate whole oats and ground oats in about equal amounts. However, when the skim-milk was fed, the corn was preferred and whole corn was preferred to cracked corn, and at six months of age the calves had eaten six times as much corn as all other concentrates combined. C. F. Curtiss summing up feeding trials of different concentrates for calves on skim-milk, says: "Greater influence is exerted by fats and carbohydrates than by proteins and nitrogenous feeds are not needed in skimmilk ration but fat or its equivalent is needed." The Kansas, Nebraska, Virginia, and Kentucky stations report tests with calves that confirm this statement. Shelled corn was preferable to other feeds at all stations. With calves intended for dairy purposes it is well to use a grain, as oats, linseed meal, soy-bean meal, or bran with the corn in order to furnish more muscle building material. Bran and oats are comparable; though bran is perhaps more laxative. Cottonseed meal should not be fed to young calves. There is something toxic in its nature that is injurious and often fatal to the young calf. At North Carolina, F. E. Emery fed three calves on cottonseed meal and skim-milk and in one to one and a half months all died. At Pennsylvania Station, T. S. Hunt fed three calves on cottonseed meal and skim-milk and two of them died. Just where the cause of the trouble lies is not known. The "safety first" idea should be used and no cottonseed meal fed before six months of age, and only lightly until a year of age.

Grain feeds are best fed dry and not mixed with the milk.

Our trials with molasses at the station the past winter indicate that it can be used in the grain ration as a substitute for corn with calves over two months of age especially with oats forming half the grain ration.

The amount of grain that a calf will use as shown by our test varies with the age and size of the individual. It is a safe rule to allow them all the grain they desire up to two pounds a piece a day in addition to the skimmilk. Some larger calves may use more than that amount economically. Keep the grain in a convenient feed box until the calf is feeding freely and then endeavor to feed the grain so that the calf can eat it directly after drinking its milk. This method will do a great deal to overcome the tendency to suck each other.

Hay for Calves.

Reference to Table I of this bulletin shows us that the calves were nibbling at the hay when two weeks of age and were consuming a fair quantity at from five to six weeks of age. That coarse fodder is essential to the life of the calf was shown by E. Davenport, of the Illinois Station. In his work he fed four calves on rations of skim-milk and grain. The calves on skim-milk alone used as high as 70 pounds of milk a day, while those on skim-milk and grain ate one-half bushel of grain at five months of age. Neither ration satisfied their hunger. The calves did not chew their cud and eventually lost their appetite. Given straw or hay they ate it greedily, chewed cud for the first time, and recovered rapidly; without it they sickened and died.

The best hays available should be used for the young calf. A second cutting of clover or alfalfa hay is fine. Fine stemmed cowpea or soy-bean hay is good. A good quality of mixed hay is all right. Keep this hay before the calf at all times, in small quantities at first, changing frequently

in order that it may be sweet and clean, and always allowing the calves all they will eat. Do not attempt to raise a calf and use such rough feeds as oat straw or cottonseed hulls. You will be disappointed as neither will give the growth desired in a young calf. If necessary to use them; you must make up for their lack of nutriment by the use of more grain. This means more expense and also poorer results, as it is liable to result in an undersized and pot bellied calf.

Calf Meals for Calves.

Some proprietary calf meals are on the market, the purpose of which is to replace skimmilk in the ration. Several Experiment Stations have tried these out, along with home mixed calf meal and all report similar results. Dr. Lindsey in Mass. Station Bulletin 164, reports as follows: "Calf meals purchased or prepared at home will take the place of a considerable amount of whole or skimmilk and not interfere with normal growth. It is not advisable to rear calves during the first four months without daily use of three to five quarts of skim-milk. A too early attempt to accustom a calf to an exclusive diet of calf meal is likely to produce digestive disturbances that may affect the health in after life. Holstein and Ayrshire calves as a rule are better able to utilize prepared feeds than are Jersey or Guernsey calves."

At the Indiana Station Blatchford's calf meal, a home mixed meal, and skim-milk were fed against each other. Ten calves on skim-milk made the largest gains at least cost per lb. Calves on the home-mixed ration were next, while those on Blachford's calf feed gained least and cost most per pound of gain. The calves on the meals had whole mik in decreasing quantities until the fifth week and some for ten to nineteen weeks and one until six months of age. Trouble was experienced in putting them on the meal ration, digestive disturbances taking place. They conclude that the price of ready prepared calf meal is prohibitive, and that a home-mixed calf meal can be made that is acceptable. They advise its use only in case that the chief product sold is whole milk. Then the calves at six months of age will not be developed as will the milk fed calves.

Water for Calves.

The first few days the young calf will not want any water other than what it gets in its milk. At a week or ten days, when it starts nosing the hay and grain, some water will be acceptable and should be allowed. Always place the water before the young calf after feeding milk, making sure that it is not cold to chill the young calf, and no digestive disturbance will result. After this keep a supply of fresh, pure water in a clean receptacle within reach of the calf always.

Salt.

Salt is necessary if animals develop properly. The system needs it in carrying on its functions. The young calf gets a liberal amount of mineral from its milk, but will lick at salt at a very early age. Place salt within reach of the young calf and you will be surprised how soon it will lick it.

Pasture.

We are not ready to state conclusively at what age young calves should be placed on pasture. Stockmen express different opinions. We do know that as good calves can be grown in the dry lot by the use of plenty of good hay as can when they have the run of the pasture, and our results so far at the station show slightly larger gains and better finished calves in the dry lot up till six months. In any instance the calf pasture should

be separate from that pasture in which the older cattle are running. There should be, also, a shed or calf barn accessible to the calves where they can seek shelter from storm, cold winds, or the hot sun.

The Calf Barn.

The calf barn should be so constructed that the sun can gain access to every part of it at some time during the day. The side or sides toward the sun should be well supplied with windows, to furnish light and allow the sun to enter. These windows, if hung at the bottom on hinges, so that they will swing in, opening into a kind of a casing will furnish ventilation and yet the cold air will not strike directly on the calves. This barn should be so constructed that it can be divided off into small pens if occasion requires. A young calf will be easier cared for and will thrive better if it can be placed in a small pen by itself until a month of age. After this age not more than four or five calves should be placed in the same pen, and these should be as nearly of an age and size as possible. See that each pen is supplied with a convenient hay rack, with a grain feed box and also with stanchions to hold the calves while feeding their milk. The grain feed box can be built directly in front of the stanchions and the calves fed their grain at once after having had their milk.

Clean this stable at regular intervals and do not have these intervals too long. See that the calves are always supplied with a clean, dry bed. A coat of white wash, spring and fall, will aid in keeping the house free from disease, and make it lighter and offer some assurance that it will be kept clean.

Dehorning.

A great many practical stockmen and breeders prefer hornless animals. The best time to dehorn a calf is at one week or ten days of age when the young horn or button is just showing. At this time clip the hair from around this button until you have a spot about one inch in diameter, the button in the center. Now take a stick of caustic potash (which can be had at nearly every drug store), wet the end in water and rub on this button until it becomes quite red, almost bleeding. Make sure that you touch all the button as if any part of it is missed a stub horn will result. Also do not rub out on the skin bordering the button more than is necessary as it will cause too much of a sore. A piece of paper around the stick of potash will protect the operator's fingers.

This is the method followed at the station and is preferable to any other.

Diseases of the Young Calf.

The most troublesome disease of the young calf is scours. There are two forms of this disease. The most common form is non-contagious and is caused by some condition which throws the calf's digestive system out of order. In this disease the bowel discharges are normal in color at first but so soft and watery that they soon discolor the tail of the young calf. The calf becomes dull, listless, gaunted and loses its appetite. Some things to observe in seeking to prevent this form of scours are: do not overfeed the young calf; be regular in your time of feeding; use the same cow's (preferably the dam's) milk at each feeding, and feed this before it has had time to cool; make certain that the feed buckets are clean and sweet; keep the calf's stall dry and well bedded; keep the calf out of drafts and do not expose to cold winds or rains.

Should the calf contract scours the first thing to do is to reduce its milk at least one half. Often it is desirable to miss a feed altogether, and feed a reduced ration afterwards, gradually bringing the calf back to the full ration. Many cases of scours will give away to this treatment. Should this not be successful, two or three ounces of castor oil, depending on the

size of the calf, in a little milk may be given. The milk ration is reduced at the same time.

Formalin used in the proportion of three drops of formalin to one-half pound or one pint of the reduced ration is also recommended as a treatment for scours.

The other forms of scours, called white scours, sometimes occurs. It is very contagious. It usually occurs within two or three days after birth and is almost always fatal. The young calf is dull, listless, weak and shrunken and breathing is more or less difficult. The bowel discharges are profuse, yellowish white and very offensive. Prevention is about the only remedy. Prevention consists, first in a thorough disinfection of the premises, where this disease has made its appearance. Also, as the disease gains entrance to the young calf's system through the umbilical cord, the external genital organs of the cow before birth and of the navel cord of the calf immediately after birth should be washed with an antiseptic solution. A carbolic acid solution, (½ oz. to a quart of water) is recommended. The navel cord should also be tied with a cord taken from a strong carbolic acid solution, and then washed with a potassium iodide solution made of iodine one-half dram; iodide of potassium, one-half dram; water, one quart. When dry cover the cord with a coating of tar containing 1 per cent of iodin. This is the method recommended by the Bureau of Animal Industry of the United States.

The stall in which the young calf is born should be prepared by cleaning out, thoroughly disinfecting and then supplying with fresh bedding, which should be continually removed to insure its being fresh when the calf is dropped.

It is well to enlist the aid of a veterinarian when this form of scours appears.

Another disease that has caused considerable trouble with young calves is Hemorrhagic Septaecemia. This disease is evidenced by a drooping condition of the calf, more or less diarrhea, perhaps a slight cough, a continued emaciation when the disease becomes chronic, and a general weakness. The disease calls for a separation of the sick animal which usually dies within a few days, and a thorough disinfection of the stable. A vaccine is on the market which is more or less successful in preventing the disease, and which, although not recommended as a cure, can at least be recommended as an insurance.

Worms may at times give trouble with calves that are running on pasture. The worms cause emaciation, diarrhea, a general weakening and lack of resistance to unfavorable conditions. The appetite usually remains good.

Preventative measures as burning and abandoning or cultivating the pasture are recommended. It is claimed that such measures will free the pasture in eighteen months if no material from infested lands is washed onto the treated pasture.

Calves which were evidently infested with worms at the college seemed to respond to the following treatment: Five grams of copper sulphate was dissolved in one-half a pint of water. The calf was allowed no feed for twenty-four hours and was then drenched with this solution. No feed was fed for three hours after dosing. In ten days the treatment was repeated and, if necessary, the third time in another ten days.

Another solution used with about the same result and in the same way was five grams of copper sulphate and five grams of tobacco dust dissolved by boiling in one-half pint of water.